

Documenting Middleton Hospital, Communicable Disease Centre and the Medical Heritage of Singapore¹
NHB Heritage Research Project Final Report

Executive Summary

The research project makes the following findings and recommendations:

1. Middleton Hospital/Communicable Disease Centre (CDC) was founded in 1913, not 1907 as stated in some sources.
2. There was both continuity and change in CDC's history across the colonial and post-colonial periods.
3. CDC played an important historical role as the national treatment, quarantine and isolation centre for many infectious diseases of public health importance.
4. The pavilion wards of CDC are rich with history.
5. Physicians, nurses and other staff played key roles in infectious disease management.
6. CDC worked closely with other government agencies and non-governmental organisations.
7. CDC is a theatre of memory.
8. The Administration Block, doctors' quarters, matron's quarters, and some of the historic wards should be conserved and converted to new uses.
9. CDC has varied heritage programming options as a theatre of memory.

Prepared by

Dr Loh Kah Seng

A/Prof Hsu Li Yang

Dr Deborah Ng

Dr Margaret Soon

¹ This project is supported by the Heritage Research Grant of the National Heritage Board, Singapore. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Heritage Board, Singapore.

Research Background, Objectives and Scope

Our project documented the history and heritage of the Communicable Disease Centre (CDC, 1985-2018) and its predecessors, the Moulmein Road Hospital (1913-1920) and Middleton Hospital (MH, 1920-1985).

The research was carried out in the context of CDC's closure at the end of 2018 and replacement by National Centre for Infectious Disease (NCID). The question of heritage conservation and re-purposing of CDC grounds and wards was pertinent to the project. At the present time, CDC has been returned to the Singapore Land Authority (SLA) and discussions are ongoing on the issue of conservation of the buildings and facilities.

A broad approach to the long history and rich heritage of CDC was undertaken with the aim of addressing the following issues and questions:

- The historical role of CDC as Singapore's treatment, quarantine and isolation centre for infectious diseases of public health importance, with reference to the management of infectious disease outbreaks and care for patients.
- The relationship between CDC and other government agencies involved in infectious disease management.
- The roles of physicians, nurses and other hospital staff.
- The experiences and memories of patients and their families.
- The role of non-governmental and community organisations and their relationship with CDC.
- Change and continuity in the history of CDC across the colonial and postcolonial periods in the context of the 2019 Singapore Bicentennial.

A. Methodology

Documentary Research

We collected and annotated a large volume of archival and published sources on the history of CDC:

- Annual reports of the Medical Department in the Colonial Office (CO) archives, particularly the series CO 273 and CO 275.
- Singapore Municipality administration reports.
- City Council annual reports.
- Post-colonial Medical Department and Ministry of Health (MOH) annual reports and publicity material.
- Government records of the Ministry of Health, Housing and Development Board, Ministry of Culture, and Building Control Division at the National Archives of Singapore (NAS).
- Ministry of the Environment annual reports.
- Reports of medical conferences on infectious diseases.
- Medical periodicals containing the research of physicians, namely, the *Journal of the*

Malayan Branch of the British Medical Association, Journal of the Straits Medical Association, Medical Journal of Malaya, Singapore Medical Journal, and Epidemiological News Bulletin.

- Oral history interviews at NAS.
- Newspaper articles on CDC and infectious disease outbreaks.
- Secondary literature, particularly sociological studies and unpublished academic exercises on infectious diseases.

The 2 volumes of HD 113/45 Middleton Hospital files at NAS were particularly useful. They traced efforts by the colonial government and Municipal Commission (subsequently City Council) to develop and expand MH between 1946 and 1957, although there are some gaps in the period covered. These discussions threw light on the contested status of MH as a municipal hospital and the construction of the historic Cubicle Ward. The files also provided useful information on the names and uses of MH's wards:

Table 1. Middleton Hospital wards and their designated uses (Source: HD 113/45 Vol. 2 Middleton Hospital, Memo from W.E. Hutchinson D.H.O., 20 June 1951)

A, B, C, M, N, O, each of 2 beds for Isolation and Miscellaneous Cases	12 beds
L Diphtheria	26 beds
L1 Diphtheria	10 beds
L2 Diphtheria Convalescent	10 beds
D1 Enteric M (typhoid)	8 beds
D2 Enteric F (typhoid)	8 beds
F Measles etc	4 beds
J Dysenteries	18 beds
G Chickenpox	22 beds
E Dysenteries and Emergency Ward, at present polio	32 beds
K polio	32 beds
Total	176 beds
H Carriers, contacts etc rarely used	30 beds

Another archival file, MRH 17.04.3 National Health Campaign, documented MOH's public health campaigns against infectious diseases in the 1970s, such as venereal disease and food-borne diseases.

Cartographic and Photographic Research

We found useful cartographic and photographic material, namely:

- Photographs of CDC.
- Maps and building plans at NAS.
- Audio-visual material, including a recorded tour of CDC in 1999 (NAS, Tan Tock Seng Hospital, TTSH, Accession Number 1999000813).

NAS had less than 30 photographs of CDC. Through oral history, we found a large number of personal photographs and other primary documents from our interviewees, including two letters from patients and their family members thanking CDC staff. These highlight important aspects of work, play and relationships at CDC, which are often not emphasised in the official record. There were photographs of festive occasions (eating was a common theme), sports (especially netball) and recreation.

In addition, the following cadastral maps of CDC between 1932 and 1979 at NAS which our map researcher Mr Mok Ly Yng found were also useful in showing the locations and names of some, though not all, of the wards. Such information was lacking in the Singapore Town and Topographic maps. It was not easy to locate these maps as they were not distinguished from other maps in the catalogue:

- Singapore, Sheet 191-1, period covered 1932-1979.
- Singapore, Sheet 190-4, period covered 1937-1958.
- Singapore, Sheet 190-4, period covered 1937-1979.

With assistance from NAS, we located 4 PWD building plans on MH between 1967-1981. We were not able to locate pre-independence plans. NAS informed us that the Building Control Division's plans covered only commercial buildings; MH was a municipal and subsequently public hospital.

Oral History

We interviewed a large group of stakeholders connected with the history of CDC, including physicians, public health officials, nurses and other staff, and former patients. We obtained some interview contacts from Tan Tock Seng Hospital (TTSH), while others were found by word of mouth.

The team also spoke to journalist Melody Zaccus, who wrote an article on the origins of CDC in the *Straits Times* on 14 March 2019 ('Patients' accounts sought to tell CDC's story' <https://www.straitstimes.com/singapore/patients-accounts-sought-to-tell-cdc-s-story>). The article contained a call for patient and community memories of CDC, which enabled us to locate three former patients and the family of the former Medical Superintendent of MH, Dr Leong Kok Wah.

The total number of interviews we conducted is 29.

1. Dr Edmund Hugh Monteiro (former Director, CDC)
2. Prof Chew Suok Kai (former Director, CDC)
3. Dr David Allen (former doctor, CDC)
4. Mr Harbhajan Singh (former Nursing Manager, CDC)
5. Ms Akhterun Nisha (nurse, CDC)
6. Mr Prem Kallat (former patient, CDC)

7. Mr Goh Wai Mun, Eric (former patient, CDC)
8. Mr Narindar Singh (former patient, CDC)
9. Mr Leong Kwai Wah (brother of Dr Leong Kwok Wah, medical superintendent of MH)
10. Mr Bachan Singh (former patient, CDC)
11. Ms Linda Leong (daughter of Dr Leong Kwok Wah, phone interview)
12. Ms Ong Quek Neo (former nurse, CDC)
13. Ms Han Kwee Yin (former nurse, CDC)
14. Ms Meeravathy PS (former nurse, CDC)
15. Mr George Yeo Poh Kee (former telephone operator, CDC)
16. Prof Roy Chan (dermatologist, Action for AIDS)
17. Ms Dorothy Gomez (former nurse, CDC)
18. Ms Vinotha Malar (former nurse, CDC)
19. Mr Paul Toh (Action for AIDS)
20. A/Prof Ooi Peng Lim (public health, MOH)
21. Prof Leo Yee Sin (former Clinical Director, CDC)
22. Ms Low Hong Siam (former nurse, CDC)
23. Ms Rama bai Nathan (former nurse, CDC)
24. Ms Iris Verghese (former health adviser)
25. Ms Cheong Yoke Ling (former nurse, CDC)
26. Ms Joyce Arokiasamy (former nurse, CDC)
27. Ms June Leng (former nurse, CDC)
28. Prof Chew Chin Hin (doctor, TTSRH)
29. Dr Hsu Li Yang (former doctor, CDC)

The oral histories of doctors, nurses and patients provided a rich account of the recent history of CDC from the 1960s and 1970s. They revealed CDC to be what historian Raphael Samuel termed ‘a theatre of memory’. The memories included both positive reminiscences from the hospital staff and more ambivalent recollections from patients and their kin. They map the deep and complex heritage of CDC, namely:

- The human side of CDC’s recent history, such as people’s stories of chickenpox in the 1970s, HIV/AIDS in the 1980s and 1990s and the 2003 severe acute respiratory syndrome (SARS) outbreak.
- The commitment and dedication of doctors, nurses and other staff in infectious disease work despite reservations from their families and the public.
- The role of CDC staff, especially nurses, in caring for patients on a holistic level.
- The memories of working in CDC and its memorable buildings. The staff perceived themselves to be akin to a family.

Oral history was thus important in modifying the mainstream narrative and perception of CDC as a place to be feared.

Challenges Faced

There were a number of challenges encountered in the course of the research. Archival

research was difficult, forcing the team to rely on published sources and oral history interviews. We found only a handful of archival files on CDC at NAS, which is a small fraction of the government documents on infectious disease control. We could not find records belonging to MH or TTSRH. We did not have insights into both daily and exceptional events at CDC, such as responses to specific infectious disease outbreaks and development plans for new wards (except for the aforementioned HD 113/45 Middleton Hospital). On more recent history, MOH had ceased publishing its annual reports after 2000. It is imperative to make archival documents available and more accessible.

The question of heritage conservation required us to trace the history of the pavilion wards of CDC as fully as possible. We attempted to map the development, locations and functions of the buildings from 1913 to the present. This work was inferential, drawing upon fragments of information. However, it was rendered difficult by the incomplete archival and cartographic sources for the long period of history. We have done our utmost to verify and triangulate this research, but the possibility of error remains.

The oral history unit at NAS had conducted interviews on CDC. Some are detailed and useful, such as the interview of the former Medical Superintendent, Dr Edmund Monteiro, whom NAS interviewed in 1997. However, most of the NAS interviews were professionally and socially top-heavy, focusing on prominent doctors and nurses. A more comprehensive oral history project should involve a wider socio-economic spectrum of people. One of our findings was how junior hospital staff who supported the senior administrators also played important roles and have meaningful stories to relate, especially the nurses. The memories of patients and their families and friends also added to a more nuanced and richer narrative of CDC.

Our team had difficulty finding more former patients, and those whom we did interview were people who were children when they were warded in CDC. Their memories, while interesting, expressed a child's perspective of hospitalisation and treatment. The difficulty of locating former patients suggests a reluctance to discuss their illnesses, which may be linked to social stigma towards infectious diseases such as AIDS and SARS.

B. Deliverables

The following project deliverables have been completed:

- Article, 'The Origins of Singapore's Communicable Disease Centre: Hanging Fire', *Kyoto Review of Southeast Asia*, Issue 26, November 2019,
<https://kyotoreview.org/issue-26/the-origins-of-singapores-communicable-disease-centre-hanging-fire/>.
- Talk, 'The Origins of the Communicable Disease Centre, Singapore: Hanging Fire', at NCID, 4 September 2019.
- Talk at the Urban Redevelopment Authority on the heritage of the pavilion wards of CDC in September/October 2019.

Other outcomes not originally proposed as deliverables:

- Research and materials will be used in the commemorative CDC photobook ‘The Lion Sleeps Tonight’
- Talk, ‘Medical Heritage of Singapore – Middleton Hospital & CDC’, at Saw Swee Hock School of Public Health, 4 September 2019.

C. Major Research Findings

1. CDC was founded in 1913, not 1907 as stated in some sources.

Municipal, government and newspaper sources state clearly that CDC was founded in 1913, not 1907. The latter year has been erroneously repeated several times in some sources, including the CDC commemorative book, *100 Years: A Commemorative Publication for the Communicable Disease Centre* (2007), news reports and captions for NAS photos. This needs to be corrected as even CDC staff have stated the wrong year.

The origins of CDC was a milestone in Singapore history in the following ways:

- The founding of CDC was contested. For two decades, the colonial government and Municipal Commission pushed the responsibility for infectious disease control to each other. Only after protracted discussions did the commission agree to take responsibility for infectious diseases in the town. Even so, the colonial government reduced the size and capacity of the hospital for reasons of cost.
- There was great difficulty in finding a suitable location for the hospital, which reflected the fear of infectious diseases among the public.
- The original hospital did not surmount social divisions in colonial Singapore between Europeans and Asians, and between upper class and working class Asians. It had different wards for different nationalities and classes of patients.

1.1 Struggle for an infectious diseases hospital

The need for an infectious diseases hospital in Singapore at the end of the 19th century was dire. The Quarantine Station on St. John’s Island, which screened immigrants arriving by ship, was unsuitable for patients residing in Singapore. The General Hospital (GH) treated European and Eurasian cases of infectious diseases. Of particular official concern was the ‘Big 3’ of dangerous notifiable illnesses – smallpox, bubonic plague, and cholera.

After 1884, Asian patients with infectious diseases were treated in the vicinity of TTSF at Balestier. Municipal records refer to the Balestier facility variously as the Infectious Diseases Hospital and Quarantine Camp, the Smallpox Hospital or the Hospital for Contagious Diseases. From this multitude of place names, the facility was evidently not a proper hospital. It treated only seriously ill, male Asian working class patients, so numerous other cases were not treated in this facility. Sick persons commonly fled from their houses to another part of the town, were ejected by their landlords, or were dropped off by rickshaw a short distance

away from the hospital. Occasionally, bodies of the dead were dumped openly in the street. In 1899, Alex Gentle, the president of the Municipal Commission, admitted that upper class Asians, women and children avoided the Balestier Road facility due to ‘fear of injury’.

This led to a vicious circle: the more often patients died in that hospital, the greater the people’s predisposition to avoid it. Singapore suffered four outbreaks of smallpox and five of cholera between 1892 and 1911. A proper facility was needed, but who would fund it? The colonial government demurred, stating that much of its budget was committed to military expenditure. The Municipal Commission gave priority to matters such as water supply and disposal of night soil and refuse. The colonial government and the commission passed the buck back and forth.

In 1893, the commission agreed to take charge of infectious diseases in the urban area, subject to a host of financial and administrative conditions. In 1899, the government pressed the commission to do more, calling for improved accommodations for Asian patients with infectious diseases. But the principal civil medical officer and colonial engineer, after assessing the quarantine camp at Balestier Plain and the adjoining hospital for infectious disease, surmised that the patients were satisfied with the accommodation and treatment.

The sole dissenting voice was Dr W.R.C. Middleton, the Municipal Health Officer, who protested that the facilities, with walls and floors ‘impregnated with the germs of diseases treated there’, were plainly unsuitable for upper class Asian patients. Nevertheless, the Governor of the Straits Settlements, Charles Mitchell, decided that ‘it is not desirable to erect a superior class of hospital for infectious diseases at Balestier Road’.

Finally, in 1907, the government passed Municipal Ordinance XXXVII, which expanded the work of the Municipal Commission, including ‘to pass By-Laws...for suppression and prevention of dangerous infectious diseases and segregation of patients suffering from such diseases’. Dr Middleton, a Scot, played an influential role in the new ordinance, calling for infectious disease control to draw upon the provisions of the Public Health (Scotland) Act. The commission would be responsible for the entire town: to detect overcrowding, demolish insanitary houses, provide back lanes and open spaces, and rebuild unhealthy areas.

1.2 Struggle over the site

The 1907 ordinance did not bring an end to the issue, for the choice of location for the proposed new infectious diseases hospital sparked further conflict. Two years earlier, the government had targeted a 13-acre site at Moulmein Road close to the TTSB, with the building cost to be jointly borne by the government and commission. But Dr W.J. Simpson, a sanitary expert from Britain, felt that the site was too small to manage an epidemic.

The commissioners turned to alternative sites. One was at Paya Lebar. But the government and commission were inundated by protests from landowners and residents. The editor of *Singapore Free Press* submitted a litany of reasons why there was ‘no greater calamity’ than Paya Lebar: it was far from town and close to a growing village community and the

Recreation Hotel, it would be expensive to acquire the land and would drive down land prices, and infection may be spread by mosquitos and flies. A letter to the paper by ‘Paya Lebarite’, apparently a resident, concurred on the adverse effects on the area, and the need for expensive water piping from the 3rd Mile Stone.

The opposition forced the commission to abandon the Paya Lebar site. Alternative proposals met similar fates. The most promising location appeared to be near Hood Eng Estate at Pasir Panjang, owned by the Tanjong Pagar Dock Company. There were futile talks for three months, with the company submitting ‘contradictory’ reasons against the proposal.

Eventually, the commissioners reverted to the Moulmein Road site. Dr Middleton and Mr R. Pierce, the municipal engineer, added more land, doubling the site to 25 acres. But there was still opposition from the Governor John Anderson, who in 1906 had deemed the original scheme to be ‘too elaborate and the cost excessive’. He repeatedly curtailed it. In 1910, after nearly a decade of discussions, the municipality lamented that the project was ‘still hanging fire’ – akin to a flintlock musket’s failure to ignite. On 16 September 1910, the commission unanimously stood its ground to reject further proposed cuts to the budget by the government.

Finally, in 1911, construction of the hospital commenced. In the same year, the largely well-to-do Chetty community submitted a proposal for a hospital of their own, to be built at Paya Lebar. This highlighted the question of class and ethnicity. The Municipal Commission denied the request but only because it did not want separate hospitals. A commission on amendments to the Quarantine and Prevention of Disease Ordinance accepted the objections of upper class Asians to being warded with coolies, and that superior wards for certain groups of patients could be built within the new hospital.

The Municipal Commission accepted these recommendations. The hospital would only have Class B and lower wards for working class Asian patients with cholera and plague. However, European and upper class Asian patients with these diseases could still receive superior accommodation by staying in the hospital’s observation and discharge wards. For smallpox patients, the commission made concessions for a trio of wards – European, Class A and Class B – the last two being for Asians. The hospital’s planners thus looked to accommodate, rather than reform, prevailing class and racial sentiments in colonial Singapore.

On 1 May 1913, the colonial government announced the opening of a new ‘Infectious Diseases Hospital’ at Moulmein Road, administered by the Municipal Commission. It had 172 beds, comprising three sections for each of the notifiable infectious diseases of the day: smallpox, bubonic plague and cholera. The government stated apologetically that only the smallpox section had been built as planned, with separate wards for Europeans, upper and lower class Asians. The cholera and plague sections had only lower class Asian wards, but Europeans and upper class Asians could choose to be treated in the observation and discharge wards.

2. There was both continuity and change in CDC’s history across the colonial and post-

colonial periods.

The 2019 Singapore Bicentennial provides a useful framework for reflecting on the complex nature of colonial rule and the colonial legacy for Singapore. With its 106-year long history, CDC offers a salient example of change and continuity across the colonial and post-colonial periods. Sections 2-5 of this report address various aspects of change and continuity, namely, CDC's work in managing different infectious diseases, the development of its pavilion wards, and the contributions of the hospital staff.

Our project highlighted CDC's long-term role as the national isolation, quarantine and treatment centre for infectious diseases, dealing with different infectious diseases from 1913 to the present. Physically, more wards were built in CDC, particularly in the 1910s and 1920s and after the Second World War and Singapore's independence. The research also found that both dealing with infectious disease outbreaks and plans to develop CDC were often challenging and contested.

2.1 Pre-World War Two developments, 1913-1941

The new hospital built in 1913 had no proper name and was simply known as the Moulmein Road Hospital in the municipal reports. The government hailed it as a 'great advance' in infectious disease control, 'properly equipped' and acceptable to the community. Such self-praise was, however, premature. Accommodation quickly became inadequate; clearly, the government had made a mistake in curtailing the original plan.

Although originally the Municipal Commission prioritised the notifiable diseases, the hospital had to treat other, more prevalent infectious diseases, such as diphtheria (cases were transferred from GH to the new hospital in 1917), chickenpox and puerperal fever (both made notifiable in 1916), cerebrospinal fever (notifiable in 1917), and tuberculosis (notifiable in 1918). In 1918-1919, the hospital was overwhelmed by a local outbreak of the deadly global influenza epidemic.

The commission expanded the original hospital premises by acquiring of small pieces of adjoining land. A ward for diphtheria was added in 1919, followed by a second cholera ward the following year. Moulmein Road Hospital originally had a doctor's bungalow and nurses' quarters, located beyond the front gate and to the east, while to the west were common quarters for servants, attendants and other subordinate staff. The Municipal Commission added or expanded the following staff quarters:

- In 1913 and 1915, quarters were built for gardeners and an extension was made to the Matron's quarters.
- In 1917, another kitchen and bathroom were added to dressers' quarters.
- In 1920, new doctors' quarters were completed, and a new quarter added to the nurse's bungalow.
- In 1922, new Ayahs' quarters, kitchen quarters for the Medical Superintendent's bungalow, and boys' quarters were completed.

- In 1925, new quarters for the Matron were completed.
- In 1926, quarters were built for the Resident Medical Officer.
- In 1931, a block of quarters for kebuns was built.

In 1920, the hospital was formally bestowed the name of Middleton Hospital. This fittingly recognised the work and contributions of W.R.C. Middleton, who retired from the municipality that year. As Municipal Health Officer, Middleton had been a tireless advocate for the hospital and more generally on sanitary matters in Singapore.

Before the outbreak of the Second World War (WWII), there was a shortage of beds at MH due to an increase in the volume of work. In 1941, the British made plans to build a 48-bed ward, foundations and services for two 24-bed wards, and 3 small observation wards. But before these plans could be realised, the Japanese attacked Malaya.

Prof Chew Chin Hin (oral history, 1999, 2019) stated that a large bungalow was built in MH in the mid-1930s to house senior medical officers, which Japanese administrators occupied during the war. After the war, the bungalow housed senior officers. It was handed over to TTS defence in the mid-1960s, housing nurses, expatriate physiotherapists and medical ancillary staff. In 1991-1992, it became the office for the staff of the restructured TTS defence.

Prof Chew added that MH, along with TTS defence, was also an important teaching hospital for medical students of the King Edward VII College of Medicine during the colonial period and from 1949 the University of Malaya. This role was eventually taken over by the Singapore General Hospital (SGH). In the 1930s, College of Medicine students attended MH for clinical instruction in infectious diseases. In 1933, Professor R.B. Hawes and Dr E.C. Vardy gave lectures on infectious diseases. In 1956, 90 medical students and 7 postgraduate students for the Diploma in Public Health attended courses on infectious diseases at MH.

2.2 Wartime and post-war developments

During the Japanese occupation, MH was renamed Densen Byoin ('Infectious Disease Hospital' in Japanese). It was run by Dr E.S. Monteiro, the Medical Superintendent, and Mrs Lang Jun Hua, the Matron. This was a sign of locals taking over the administration during the war, replacing Europeans who had been interned by the Japanese. In 1947, Dr Monteiro was presented with a Certificate of Commendation for his services during the war and occupation and the British Military Administration immediately after the war.

Information on this period is sketchy, though the hospital officially had 200 beds for infectious disease cases, of which 20 were First Class beds, 40 were Second Class and 140 were Third Class. A new ward was also built for typhoid and dysentery in this time (quite remarkable in the context of war). The hospital was allegedly able to continue its pre-war work on infectious diseases. However, this was unlikely, given the disruption the war brought to medical services in Singapore in general.

After the Japanese occupation ended, the key development was MH's expansion and upgrading. This turned out, however, to be another fraught matter. The returning British colonial government was committed to expand and improve medical services for the general population. The medical report for 1948 alluded to a new period of planning and rehabilitation in order to return Singapore to the standards of the pre-war medical service, while the following year's report forecast a period of preparation for the future and an attempt to maintain existing health service standards.

However, the initial colonial focus was on major hospitals such as SGH, acute diseases and the health of children. When the British first announced their ambitious proposals for a 10-year Medical Plan in 1947, they proposed a new infectious disease hospital with 50 beds for major infectious diseases outside municipal limits, in addition to MH. Health officials also made calls to expand the staff and upgrade the facilities in MH. However, the final Medical Plan of 1948, which was more modest than the original, did not commit to the upgrading of MH or the second infectious disease hospital.

The government deferred the matter to a committee which would discuss it with the Municipal Commission. The committee discussed a range of issues pertaining to the shortcomings and needs of MH. Some of these were due to the neglect during the war, but others were long-range issues from the pre-war period, as shown by the development plans in 1941.

In 1950, the committee decided that there was no need for a second infectious disease hospital, so any expansion should take place on the Moulmein Road site. Dr Ng See Yook, the Medical Superintendent of MH, disagreed with the original Medical Plan proposals, stating that it was 'futile' to build a second infectious disease hospital and that it was better to concentrate infectious disease management for all of Singapore in MH.

In discussing the development of MH, health officials illuminated a long-standing dilemma in the history of infectious disease management in Singapore: that the number of beds and staff required in such a hospital was not large except during an epidemic. In one meeting, the committee succinctly noted, 'To keep a large staff for a hospital in which the bedstate was bound to fluctuate widely was uneconomic while in epidemics "demands" would have to be made on Government'.

However, Dr W.E. Hutchinson (HD 113/45 Vol. 2 Middleton Hospital, 1951), the Deputy Municipal Health Officer, argued for the expansion of staff, as

It is generally conceded that an Infectious Diseases Hospital requires to carry more staff than a General Hospital owing to the necessary restriction of movement due to the risk of cross infection i.e. the staff of each ward is self-contained'. He added that 'most of the polio cases are children who require a great deal of attention. They must be feed, bathed and clothed; linen has to be changed often and laundered; physiotherapy and hydrotherapy have to be constantly and patiently applied; splints have to be taken off and re-applied due to frequent "wetting". Similarly a diphtheria

case, especially if requiring tracheotomy, may monopolise the services of several nurses allowing for duty periods.

The issue of resources was not a new one. It can be traced to the debates in the late 19th century leading to the formation of CDC. Both instances also foreground the more recent discussions on the need for a new CDC and the establishment of NCID.

Eventually, the committee recommended the building of:

- A 20-bedded Cubicle Ward, with possible air-conditioning for two of the cubicles to be used in lieu of oxygen tents. Dr Ng emphasised that the Cubicle Ward was necessary for different infectious diseases to be treated within one ward and reducing the numbers of nursing staff required.
- An operating theatre to deal with major surgical emergencies.
- Unit Wards for the treatment of bowel diseases.

Due to the shortage of medical and nursing staff, the expansion would not take place immediately but over a period of up to five years. The Cubicle Ward was completed in 1956. The committee also proposed the acquisition of much needed medical equipment, such as a portable X-ray and electro cardiograph, and hospital furniture.

In 1951, an Infectious Diseases Committee was set up to consider the roles of the City Council and the colonial government in the management of infectious diseases in Singapore. This again hearkened to the debates which had preceded CDC's establishment in 1913. The committee recommended that the government assume complete responsibility for the operation of MH, since it administered other hospitals in Singapore. However, the City Council objected, arguing that as it was responsible for infectious diseases, it needed to have control over MH. The City Council and the government agreed to a compromise for joint dual roles on policy, with the Council having direct control of MH. This was similar to the pre-war arrangement. The Council ran MH until 1960, when the city government was abolished and the Singapore government took over MH.

The expansion of MH after the war also led to the building of additional staff housing by the City Council, sometimes beyond Moulmein Road. This was part of an 'immediate and urgent problem' in the government medical service as a whole. Dr Ng See Yook wrote a long memorandum (HD 113/45 Vol. 1 Middleton Hospital, 1950) on the housing shortage:

The quarters problem for the Staff is acute. There is a definite shortage of quarters for them. The Nurses' quarters are most unsuitable for the existing nurses. Out of the five Staff Nurses, three are married with children and live outside in private residence, and the remaining two each occupy rooms at the back which were considered before as servants' quarters. I feel that the Municipal Commissioners did not consider the suitability of the quarters when they ruled that as free quarters are available for them, they are not eligible for housing allowance. Before the war, the three ambulance drives were not stationed in this Hospital, but now, quarters have to be made available

for them, thus introducing a further shortage. I strongly recommend that the present shortage of quarters should be remedied at once and more quarters should be constructed to house all the nurses and the attendants.

Subsequently, the City Council built or acquired more staff housing, namely:

- In 1953, a block of Singapore Improvement Trust Flats on Norfolk Road was acquired for staff quarters, while seven quarters were constructed for ambulance drivers and fitters.
- In 1954, the City Council rented 16 Singapore Improvement Trust flats at Norfolk Road for Middleton Hospital staff, with six flats converted to housing for single nurses and nursing assistants.
- In 1955, City Council decided to build a ‘first rate’ hostel with modern amenities at the Moulmein-Rangoon-Norfolk roads junction for Middleton Hospital nurses.

With the development of mass public housing in the 1960s and 1970s, staff housing became less of an issue.

2.3 Post-independence developments

Our research found the post-independence period after 1965 to be notable for key policy discussions and changes in the role and status of CDC, culminating in its name changes, eventual closure, and the establishment of NCID.

In 1985, MH was absorbed into TTS defence and renamed the Communicable Disease Centre. In becoming part of TTS defence, it lost the historic name ‘Middleton’ and the status of a hospital. Dr Edmund Monteiro surmised (oral history, 1997) that the change was due to reasons of ‘economy and common sense’. He pointed out that by the early 1980s, the CDC had almost as many staff as patients, which removed the justification for a full-fledged hospital with a large complement of staff.

In 1992, when TTS defence was restructured, three of its departments involved with infectious diseases, the Epidemiology Department, Department of Infectious Diseases and Department of Tuberculosis Control, merged to constitute the Communicable Disease Centre. CDC specialised in the monitoring, prevention, control, and treatment of infectious diseases, while also providing consultancy services on hospital infectious to other government and restructured hospitals.

CDC remained under the purview of MOH until 1 April 1995, when it came under the administration of TTS defence. Explaining the move, MOH stated, ‘The change in administration has enabled the CDC to provide better medical care to patients with infectious diseases with the support of TTS defence’.

The restructuring of hospitals in Singapore in the late 1980s and early 1990s enabled them to be more flexible and autonomous in management and operations, while working on

principles of commercial accounting, cost awareness and financial discipline. Prof Chew Suok Kai (oral history, 2018) assessed these developments positively. CDC continued to handle infectious diseases, while a new Epidemiology Department was set up to study the pattern of infectious diseases, especially HIV. The new arrangement also gave CDC the best of both worlds. It had operational capacity and manpower from the restructured TTS defence, becoming more efficient as a result, and continued funding from MOH.

The early 1990s were also notable for the establishment of the Infectious Diseases specialty at CDC. As Prof Chew Suok Kai related, this was owed to the foresight of Professor Feng Pao Hsii, Head of the Department of Rheumatology and Immunology at TTS defence, who saw the need for such a specialty. Feng recruited Dr David Allen to head a new Department of Infectious Diseases at TTS defence and launch an infectious diseases training programme for local doctors. Previously, because infectious diseases were viewed as ‘jamban’ (toilet in Malay) diseases, it were not an attractive prospect for doctors.

Dr Ooi Say Tat, an infectious disease consultant, noted in *100 Years: A Commemorative Publication for the Communicable Disease Centre* (2007)

It has been a tradition and an integral part of medical training for all local medical students to experience 2 weeks of a memorable but short stint in CDC. Each year, the center organizes numerous lectures, tutorials and seminars in infectious diseases to local and international audiences, from the general public to government officials and professional societies.

Dr David Allen (oral history, 2018) added that he helped develop awareness of the importance of the infectious diseases specialty among doctors and hospital administrators. There was initially some wariness about him being an outsider, but his response was not to criticise existing practices, but to allow locals to take credit for change and improvement. He tried to be the locals’ ally rather than be confrontational. Over time, resistance to the subspecialty diminished.

Prof Leo Yee Sin (oral history, 2019) stated that when CDC came under TTS defence as part of MOH’s plan to restructure healthcare in 1992, job positions and responsibilities overlapped and became more ‘confused’. By comparison, CDC’s duties had been more clearly outlined before the restructuring. CDC was placed under TTS defence due to reasons of proximity as MOH did not want to directly manage clinical services.

Our research found plans to build a new CDC since the 1990s. The 1993 and 1995 MOH annual reports stated that ‘CDC will be rebuilt on a 0.65 ha site located to the north of the new TTS defence site. Planning for the new building is in progress’, with the centre to be ready in 1998 or 1999 respectively. These plans did not materialise.

The 2003 SARS outbreak revealed the lack of isolation beds at CDC and TTS defence. Ren Ci nursing home near TTS defence was thus converted into Communicable Disease Centre 2 (CDC 2) in August 2003 to provide additional isolation beds in the event of a future outbreak. It has

since served as a step down facility as well as acute facility for TTS defence hospital inpatients. However, this modest facility was not the new CDC.

Prof Chew Suok Kai (email correspondence, 2019) had proposed a new CDC when he was the Medical Director in 1993-1995. He recalled that there were several revisions of the plans since the mid-1990s to take into account the emerging pattern of infectious diseases. The important factors were the 2003 SARS outbreak, 2014 Ebola virus infection and bioterrorism. There were extensive discussions, studies and overseas site visits to infectious disease centres such as the CDC in the US. The discussions considered the types and size of facilities the new CDC needed, for example, whether high level biosafety wards and laboratories, which were expensive to build and maintain, were required. Prof Chew noted that NCID was the fruition of these deliberations.

Prof Leo Yee Sin (oral history, 2019) recounted that the idea for NCID originated in 1991 with Prof Chew Suok Kai's proposal to redevelop CDC. The closure of Australia's Fairfield Hospital in 1996 gave impetus to the debate on whether a new infectious diseases hospital was needed. The 1999 Nipah outbreak further strengthened the argument for a new hospital. Prof Leo added that CDC was the centrepiece in Singapore's history of infectious disease control and had worked well in handling past outbreaks, so a decentralised policy of control must have an SOP that works.

Dr David Allen (oral history, 2018) acknowledged the role of CDC as a specialist institution for infectious diseases, although this had the disadvantage of rendering patients into the 'Other', who would face ostracisation and stigma, even to doctors and nurses. He preferred HIV to be cared for in the hospital where the patient was diagnosed. But his impression was that the official view was that CDC was a useful facility, and that hospitals were not ready to take over infectious diseases.

Dr Hsu Li Yang (oral history, 2019) related that although there were attempts to build a new CDC since the 1990s, the plan was shelved after the financial crisis in 2008, but there was renewed impetus for it after the Ebola outbreak in 2014. The new centre was to be a place where epidemic infectious diseases could be contained and segregated from the rest of the population and healthcare system. The idea was to build such a centre and hope it is never used for large scale outbreaks.

In 2019, NCID, a large, 330-bed facility for infectious diseases with modern technologies, opened in Jalan Tan Tock Seng near TTS defence hospital as part of Health City Novena. Thus the establishment of NCID had taken considerable time, debate and deliberation, mirroring the those preceding founding of CDC in 1913 and development plans for MH in the 1950s. The basic issue was apparently the commitment of resources to an infectious disease hospital.

In December 2018, 105 years since its formation, CDC was closed. Its historic Moulmein Road site was gazetted for residential development. In August 2019, the SLA and heritage blogger Jerome Lim organised heritage tours of the vacated site. The 3 August tour was

attended by Dr Edmund Monteiro and several of his staff.

3. CDC played an important historical role as the national treatment, quarantine and isolation centre for infectious diseases.

CDC dealt with major infectious disease threats and outbreaks in different periods of Singapore history.

3.1 Infectious disease outbreaks, 1913-1980s

While the original purpose of MH was to handle the ‘Big 3’ of dangerous infectious diseases, smallpox, bubonic plague and cholera became relatively uncommon after 1913, though there was a serious outbreak of smallpox in 1921-1922 and another in 1935. On their rarity, the Municipal Commission stated in 1933,

it would seem that the role of the Hospital in the future will become less and less that of an isolation camp for these diseases and more and more than of a Hospital for the treatment of the ordinary infectious diseases of childhood and their sequelae.

Indeed, diphtheria, a disease of infants and young children, became the most serious illness treated at MH after 1917. Many cases were admitted in an advanced stage and had a high mortality rate. Another major disease of children treated at MH was poliomyelitis, which was made notifiable in 1941.

In the 1930s, the Municipal Commission became alarmed at the frequency of typhoid outbreaks in the town and attempted to proscribe the numerous itinerant hawkers, especially peddlers of ice-cream and iced drinks. MH had to treat typhoid patients – something it was not originally intended to do. The hospital thus came under considerable strain for dealing with a wide range of infectious diseases.

This state of affairs likely worsened during the Japanese Occupation, when MH treated for typhoid and dysentery, among other diseases. After World War Two, the volume of work and the number of cases at MH grew, as the hospital continued to deal with cases of poliomyelitis, diphtheria, typhoid, cholera, and other infectious diseases. In the 1960s, MH also screened employees of ice-cream factories for typhoid.

3.2 AIDS in the 1980s and 1990s

In 1986, following the discovery of the first Acquired Immune Deficiency Syndrome (AIDS) case in Singapore the previous year, MH became the designated institution for AIDS inpatients. Wards 76 and 76A were converted for this purpose. Treatment of this difficult, initially terminal and feared disease heralded an important phase in Singapore’s health history. Until effective and affordable drugs for AIDS appeared in the mid-2000s, much of CDC’s early work with AIDS patients was limited to segregation, palliative care and counselling. As an AIDS survivor remarked, CDC was where AIDS patients ‘go to die’.

Social science studies on AIDS in Singapore have tended to emphasise the policy, media and

advocacy efforts. They are important in highlighting the lack of public understanding of HIV/AIDS, and the dearth of research on the social and human issues affecting HIV-positive persons and volunteers for AIDS. A 1998 study on the attitudes of healthcare professionals by Dr George D. Bishop, Dr Helen May-Lin Oh and Dr Hsien-Yao Swee found that the segregation of AIDS patients at CDC left many professionals with little contact with patients and even mistaken beliefs about the disease's spread. A study in 1995 by Dr Laurence Wai-Teng Leong argued that the segregation of AIDS patients in effect made CDC an 'isolation ward' and 'a medical jail where no bail was permitted'.

Our research focused rather on the care of AIDS patients by CDC staff in the 1980s and 1990s and the social stigma against the disease. There is a lack of research on the experiences of AIDS patients at CDC, particular in the earlier period from the mid-1980s. Our project sought to fill this gap through oral history interviews with CDC's healthcare workers. The interviews highlighted how CDC's staff worked and interacted with AIDS patients, often with much difficulty but also some benefit, and the varied responses of the patients.

CDC's initial response to AIDS was fraught with issues. A major labour issue emerged quickly: the well-being of the nursing staff. In April 1985, Dr Kwa Soon Bee, the Permanent Secretary of MOH and Director of Medical Services, met with Mr G. Kandasamy, the General Secretary of the Amalgamated Union of Public Employees, which included hospital staff. They discussed labour issues arising from the care of AIDS patients. Mr Kandasamy made several proposals: that AIDS patients be quarantined elsewhere as it was an incurable infectious disease, that only volunteers care for the patients, and that there be compensation for staff infected by the disease whilst working there. He also criticised the facilities at CDC as inadequate, with the patients not separated from the nursing station.

In addition, some medical staff at CDC and Middle Road Hospital resigned or asked to be transferred elsewhere upon finding out that three male prostitutes with AIDS were warded in MH in 1985. The *Singapore Monitor* called this a 'revolt' of the staff.

Our research uncovered first-hand accounts of these difficulties and CDC's responses. Dr Edmund Monteiro (oral history, 2018) agreed that two of his doctors left CDC because of family pressure over AIDS. Through the union, the nurses submitted a petition to the government against treating AIDS patients and 'almost wanted to down tools'. Initially, some nurses left the patients' food outside the ward and asked to use disposables. To allay such mistaken concerns, Monteiro arranged for a senior nurse to attend a HIV workshop in Sydney to establish that the use of disposables was unnecessary. From hindsight, Monteiro felt that the matter was a 'storm in a teacup'. He knew of a resident in the HDB block opposite CDC who was worried about being infected. He emphasised the importance of having facts on infectious diseases.

Dr Monteiro thought that the early AIDS cases were 'very instructive', for they were not of homosexuals or drug addicts or people of low socio-economic status, there being also an airline steward and a Church elder among the cases. He found it difficult to work with gays

and drug addicts who had AIDS. Gays felt that their infection was inevitable as they could not ask their partners to use condoms; this sense of resignation depressed Monteiro.

Dr David Allen (oral history, 2018) recounted that working with AIDS patients was difficult although the number of AIDS patients was not greater than other infectious diseases. Of Wards 76 and 76A, he said, ‘It was sad when you walk in’. The patients felt abandoned and ostracised, as in the US. Some of them had visitors, but not others. There was an almoner (likely Iris Verghese) who interviewed the patients. Although they were distraught and had mood disorders due to AIDS being a terminal illness then, she managed to give them hope.

Ms Iris Verghese (oral history, 2019), a health adviser, related that she counselled the first AIDS patient in Singapore in 1985, who was a young, gay professional. They met in Middle Road Hospital and he broke down and cried. She just held him; ‘After he cried...he felt so good’. She did not know much about AIDS initially, but felt, ‘I’m the type, everything also can’. Her colleagues asked her why she was so brave when doctors and nurses were resigning. She thought about the AIDS patient, ‘He’s a human being. I was thinking of Mother Teresa. She dealt with lepers. I have faith. If you do, He will look after me’. Her husband was supportive of her work with AIDS patients. There was much stigma attached to AIDS because it was perceived to be a moral illness, a ‘dirty’ disease which was sexually transmitted through sex with prostitutes or homosexuals.

Ms Verghese taught her patients how to break the news to their partners. Sometimes they did role-play. She suggested that the patients bring their spouses to CDC. She connected new patients with those who had informed their family. Among the many patients and their families she could still recall, there was a family of three who all died of AIDS. The father was a foreigner and the mother was a Singaporean.

Together with her husband, Ms Verghese started a family self-help group at the Patient Care Centre (PCC) at CDC. The AIDS patients were receptive to the group because ‘they were on the brink of death...and they don’t care who knows (about their illness)’. During the meetings at the PCC, the group had hugging sessions, sex workshops and health workshops. She said, ‘These patients, they feel rejected, dirty. When you hug them, they feel so wanted. It is so therapeutic’. The group received financial support from Action for AIDS (AfA).

Prof Roy Chan (oral history, 2019) was the founder of Action for AIDS. He stated that when AIDS was incurable in the mid-1980s, CDC could only provide palliative care. CDC did ‘as well as it could’ in the circumstances, but it became akin to a ‘dumping ground’. The situation was ‘very nasty’ as AIDS patients encountered much social stigma. AfA members felt that AIDS cases should not be isolated at a remote centre like CDC, but should be dealt with by doctors all over Singapore. HIV-AIDS is not a disease like SARS where patients had to be quarantined. In isolating AIDS at CDC, policymakers did not understand the disease.

Ms Low Hong Siam (also letters) (oral history, 2019) was among the first group of nurses to be posted to the AIDS ward. To receive AIDS patients, the nurses wore disposable gloves

and had syringes, pre-packed gauze, body bags, and biohazard bags. They removed the stray cats in MH before the patients arrived. She did not have any reservations about nursing AIDS patients, as she had more than 20 years of nursing experience and understood that the disease was transmitted through body fluids. She felt, ‘All we do is to take care of ourselves’, including wearing gloves and disposing of contaminated clothing, gauze and needles.

Ms Low related that it was difficult to treat the early AIDS patients as most of them died without medication. She did not have difficult patients: ‘They were all quite manageable’. Nurses should be empathetic toward them and be careful with their words. She said, ‘You have to put yourself in their position to feel the pain...This patient needs more than others. They are also fearful of not only death, but people knowing where they are’.

In 1998, Ms Low attended a six-week course for AIDS in New South Wales, Australia, with Prof Chew Suok Kai. They learned how to take care of AIDS patients, the diseases that occur due to AIDS, and precautions against infection by needle pricks and bodily fluids. She felt that nurses in Australia were not as worried as locals about being infected with AIDS; likely they had more experience dealing with AIDS patients, whose number in Singapore was small.

Ms Low possessed two archival documents of AIDS. One was a letter to CDC from the sister of an AIDS patient after he died. He had converted to Catholicism when he was in CDC, and his sisters followed suit. Another patient wrote a letter while he was receiving treatment in MH. He expressed his appreciation and gratitude toward the professionalism of the nurses, including Ms Low.

Nurse Ms Ong Quek Neo (oral history, 2019) was not worried when she was asked to cover the AIDS ward. Her husband and children were supportive of her work. But she was unable to dissuade nurses who wanted to resign. Some nurses at CDC were fearful of physical contact with AIDS patients, taking unnecessary precautions such as wearing gloves to hand them a cup of water. Nurses did have to take precautions, such as standing behind, rather than beside, a doctor when he is using a needle. She nursed the first AIDS patient, who was a sailor, and assisted the first ‘AIDS baby’ born to a mother with AIDS. CDC was ‘very tight-handed’ at the time, as it was difficult to convince nurses to work with AIDS patients. She also volunteered for AfA as a counsellor at the Kelantan clinic. Working with HIV-AIDS was fine if you understood how the disease was transmitted.

Ms Ong asked her director Dr Wong Sing Yew to send her for training on HIV-AIDS. She went to Sydney, Australia for training with Dr Leo Yee Sin for six months. She was attached to hospitals there and gained ward experience, while the tutorials were also instructive. When she returned from the course, she carried out training for CDC nurses and explained the nature of the disease to them. CDC took steps to acquire more disposals (gowns, gloves, masks etc) and make them freely available (previously they were uncommonly used), and to practise safe hand hygiene and single room isolation. It was a ‘tedious process’. There was an operating theatre at the eastern end of Block 76 for AIDS babies, as Kandang Kerbau

Hospital did not want to deliver them at the start of the HIV epidemic in Singapore.

Nurse Mr Harbhajan Singh (oral history, 2019) narrated that many nurses did not want to work with AIDS patients. Nurses had to be given incentives such as an hour less of shift work and a special \$120 monthly allowance to do so. With time, working with AIDS became more accepted. He was not worried about HIV as he knew it was sexually transmitted and it was necessary to wear gloves when treating the patients. Some patients could be difficult to work with: they wanted to smoke, and they were sick, emaciated and dehydrated. Others had social, family and economic problems, or could be aggressive. He needed both control and compromise (on smoking), or else patients might abscond from CDC.

Mr Harbhajan Singh (*100 Years*, 2007) added, ‘Another triumph at CDC is the walk-a-jog in 2000 organized to support patients with HIV/AIDS. More than \$200,000 was raised to provide medication subsidy. This was a tremendous success in view of the prejudice and discrimination against AIDS patients’.

The former Principal Medical Social Worker (MSW) Ms Ho Lai Peng (*100 Years*, 2007) recounted the role of MSWs in working with AIDS patients. Due to the stigma, patients with HIV were treated with much secrecy in the beginning. Only initials were used on patients’ case files and documentation was kept to the minimal to protect patients’ confidentiality. Their files were kept under lock and key with the MSW attending to them. CDC had its first MSW in 1991 when TTSRH was restructured. After 1995, when CDC became part of TTSRH, one MSW was retained at CDC. There was no training available in Singapore for MSWs on the management of HIV patients. They relied on books and the Internet; most resources were written by foreigners and had to be adapted to local context. In 1997, one MSW received a Health Manpower Development Programme award for a 6-month attachment at St Vincent’s Hospital, Sydney, Australia, to learn from other social workers’ experience. With time and experience, Singapore developed its assessment and intervention strategies and programmes for AIDS patients.

Ms Ho elaborated that MSWs started playing a greater role in the care of HIV patients after 1995 with the setting up for an HIV team. It gradually became routine for all patients newly diagnosed with HIV to be referred to MSWs. The issues and needs of HIV patients were recognised as unique; in addition to practical needs, there were also psychological and social needs. Counselling and providing emotional support had since become a standard part of care for HIV patients. In 1999, a HIV Women’s Support Group was set up. In 2004, a Positive Prevention Programme was set up to address the psychosocial needs of patients and to educate them about strategies to prevent further HIV transmission. In the 1990s, there were few community organisations that would accept CDC’s referrals. but the majority of community organisations had since accepted these patients. In 2007, CDC had 8 MSWs.

On the historical legacy of dealing with AIDS, Prof Chew Suok Kai (oral history, 2018) stressed the importance of not being fearful and the need for conviction in fighting infectious diseases. After AIDS, he felt Singapore could survive any future disease outbreak.

3.3 2003 SARS outbreak

CDC was designated as the screening centre for suspected SARS cases during the outbreak. As Prof Chee Yam Cheng of TTSH related, an emergency staff meeting was called at CDC's Administration Block on 14 March. Dr Leo Yee Sin and Mr Harbhajan Singh made arrangements to move patients out of Wards 72 and 71 over the weekend, so that these wards could receive suspected SARS patients on Monday. 238 people were infected by SARS, of whom 33 died.

Despite the lack of adequate radiology equipment, telephones and computers, CDC doctors evaluated 522 patients and admitted 165 patients over an intense 11-day period until the screening work was moved to the Emergency Department at TTSH. Most SARS cases were isolated and treated in TTSH, though some less serious cases were warded in CDC (such as in Ward 72). There were insufficient isolation beds at CDC, numbering only 37 of a total of 123 beds in 5 wards. Probable SARS (there were no confirmatory diagnostic tests for SARS during the initial part of the epidemic, and a combination of clinical and epidemiological criteria were used to assess the likelihood of the disease) patients had to be placed together so that newly admitted suspect cases could have single rooms to prevent cross-infection. An additional 4 cabin wards (Wards 91-94) with 80 single rooms were rapidly constructed over the course of 2 months to accommodate the urgent need for isolation facilities.

CDC itself (*100 Years*, 2007) looked upon the outbreak as its ‘finest hour’. Prof Chew Suok Kai (oral history, 2018) noted that the World Health Organisation praised Singapore’s role and transparency in the management of SARS, particularly in contact tracing. As there are numerous publications on SARS, such as TTSH’s *The Silent War* (2004), NHB’s *>38°C: Remembering SARS* and CDC’s *100 Years*, our research focused on oral history interviews with CDC staff. These interviews yielded detailed and illuminating experiences of SARS in the context of CDC’s long history as a quarantine and isolation facility.

Dr Hsu Li Yang (oral history, 2019) stated that the role of CDC in the SARS outbreak was eventually subsidiary to that of TTSH, which became the Singapore SARS hospital. The majority of cases were warded in TTSH, while only recovering or suspected cases were treated in CDC. The index case was admitted to TTSH and many of her friends who visited her and fell ill were warded in Ward 72 in CDC. A senior doctor at CDC, Dr Lee Cheng Chuan, had alerted MOH because he felt the circumstances of the index patient were ‘very unusual’. Dr Hsu made sure he was careful about hygiene during the outbreak. He remembered that ‘There was a lot of social isolation amongst the staff during those times, even those of us that went home’, and many taxi drivers and buses did not want to stop in front of CDC and TTSH.

On the lessons of the outbreak, Dr Hsu said that hospitals at the time were ‘under-invested’ for dealing with infectious disease outbreaks. There was also a lack of isolation facilities and protocols for dealing with outbreaks, and public communication was poor. MINDEF and

other ministries were brought in to help control the outbreak, eventually becoming a whole of government approach. Responding to outbreaks requires good leaders, but doctors are not traditionally trained to think institutionally or to minimise the impact of outbreaks, only to treat the patient in front of them. After SARS, the Infectious Disease Act was amended, giving the government more power to deal with such outbreaks.

Dr Hsu emphasised the need for a comprehensive account of the SARS outbreak so that the lessons can be learnt from the mistakes: ‘I always thought it would be nice to write a proper version of SARS, rather than the very nice and glossy ones that are out’. He added I think we emphasise a lot on the positive aspects of how the nation and healthcare professionals got together to overcome the disease, which I think is important and good. But at the same time, there were less savoury aspects of things. There were doctors who refused to see the patients...[and] sent their junior doctors to see patients suspected of having SARS.

Dr Hsu added that one mistake was to empty out TTSH – discharging the apparent non-SARS patients and then to have them be managed at other hospitals if they needed hospitalisation again. This was why SARS cases subsequently appeared in SGH and NUH who were former TTSH patients. Another problem during SARS was that some senior doctors pushed the cases to junior doctors. When NCID was built, it was made clear that all the staff had to deal with infectious disease outbreaks.

Mr Harbhajan Singh (oral history, 2019) recalled the SARS outbreak as ‘the worst period in my life’. It was difficult to deal with the large number of suspected and probable SARS cases, as J Clinic was small and CDC lacked facilities such as X-ray equipment (a small centre was subsequently set up), a blood laboratory (blood samples were sent to TTSH), and transport (which was provided by TTSH). It was crucial to separate routine admissions from those with travel advisories who were considered higher priority. The probable cases were treated in single rooms in Ward 72, which had about 22 beds, Ward 76 with 13 beds, and Ward 71 with 40 beds. Still, there were inadequate isolation beds in CDC and SAF had to build 4 cabin wards (Wards 91-94) for isolation, with about 18 beds each. These wards were unpopular as they were almost like confinement cells to prevent the patients from leaving. The SARS patients were worried about their illness, family and work.

During the outbreak, Mr Singh, as a nursing manager, had to manage his nurses’ morale. Some nurses from China and the Philippines wanted to return home. CDC had to allow nurses to take off days, and the morale of nurses improved. Some patients’ relatives were unhappy at being unable to visit them. Singh also took care of operational matters, e.g. he converted a room into a small X-ray facility, ensured that things ran smoothly and that the media had official approval prior to entering CDC. He was initially worried about SARS because no one understood the disease at first. He was concerned about spreading the disease to his family, but felt that as nurses, he had to do his best for the nation. He (*100 Years*, 2007) reflected,

The SARS outbreak proved to be merciless. The death toll increased with each

passing day despite heightened efforts of the multi-disciplinary team formed to tackle this menace. CDC underwent rapid changes to cope with this crisis and I cherish every change that took place. One life-long lesson I have come to embrace is that of braving difficult battles with faith despite immense fear.

Ms Ong Quek Neo (oral history, 2019) noted that although it was difficult to recruit nurses during the SARS outbreak, the problem was not as serious as in the early phase of AIDS because TTSH was able to send them nurses. SARS was unique as patients had to go home directly upon discharge, so CDC had to organise transport and explain to taxi drivers what to do.

3.4 Chronology of infectious disease outbreaks and responses, 1913-2000

Table 2. A list of several major infectious disease outbreaks and events in Singapore, particularly where CDC was involved.

Year	Development
1913	<ul style="list-style-type: none"> ● The 26-acre Moulmein Road Hospital was open on 1 May and ready for occupation on 1 June. It had 3 sections and blocks for smallpox, bubonic plague and cholera, and 172 beds, water closets and staff accommodation (p. 21). Only the smallpox section had been completed according to the approved scheme. ● There were no epidemics in the year. There were 42 admissions for cholera and smallpox in the first 6 months, with 22 deaths. Patients were mostly Chinese males (with 1 female Malay). Nearly half of cholera cases were advanced ones.
1914	<ul style="list-style-type: none"> ● There was a cholera outbreak. ● Total admissions: 190 for cholera, plague, and smallpox, mostly males and a few foreigners. The hospital and especially the senior staff were taxed by the cholera outbreak, when the cholera wards proved insufficient. No cholera patient was discharged unless he/she has no signs of the disease on 3 separate occasions. ● There were large numbers of mosquitoes flying around 2 plague patients, well-fed and gorged with blood (mosquito nets were not being used for the patients).
1915	<ul style="list-style-type: none"> ● The town was largely free from cholera. It was hoped that the new water closets would reduce the incidence of enteric fever. ● There were 53 admissions, and 19 patients died. The work was light but the staff was still stretched.
1916	<ul style="list-style-type: none"> ● Chickenpox and puerperal fever were made notifiable. The town was free from cholera and enteric fever. There was a relatively low incidence of zymotic diseases among the Chinese. ● 204 patients were treated, 200 admissions, 171 discharged, 29 died. 95 cases of chickenpox treated in observation wards. There were no cases of cholera.

Year	Development
1917	<ul style="list-style-type: none"> ● Zymotic diseases affected the Chinese more this year. ● There remained much difficulty in obtaining information on plague cases. ● There were 120 admissions, 87 patients discharged and 31 died. Two new diseases were treated at the Moulmein Road Hospital: diphtheria (transferred from congested GH) and cerebrospinal fever (made notifiable this year).
1918	<ul style="list-style-type: none"> ● This was an unhealthy year with high rates of zymotic diseases, phthisis, pneumonia, malaria and dysentery. ● The global influenza outbreak occurred in Singapore. There were 2 separate influenza outbreaks, affecting all nationalities of all ages and leading to serious complications such as pneumonia. Influenza was made a notifiable disease together with tuberculosis. The influenza outbreak was less severe in Singapore than in Penang and the Federated Malay States. The returns on influenza were understated before the illness was made notifiable. ● The Municipality had no means of protecting the population. Vacant wards at the Moulmein Road Hospital could be used to provide rest, nourishment and fresh air to patients, and new wards might be built. ● There were 209 admissions (including cases from ships) – this was a ‘phenomenal year’ for the hospital. 150 cases were discharged, 63 died. 70 cases of influenza treated in the hospital, cf. 271 at GH, 551 at TTSH, and 297 by private practitioners.
1919	<ul style="list-style-type: none"> ● There was a large number of zymotic cases (1,801) with tuberculosis and influenza being made notifiable. ● There were 175 admissions. Post-mortem on cholera deaths showed the influence of other diseases which reduced resistance and indirectly led to death, e.g. tuberculosis, syphilis, and malaria.
1920	<ul style="list-style-type: none"> ● The notification for influenza was removed. There were large numbers of cases of cerebrospinal fever. ● MH had 182 admissions. There was an increase in cases of cerebrospinal fever in recent years due to overcrowding and with a high mortality rate.
1921	<ul style="list-style-type: none"> ● There was an increase in infectious diseases in this and the previous year and a smallpox outbreak. The Chinese were most affected. ● There were 476 admissions, 364 discharges, 98 died. ● Several ward attendants were dismissed for failing to maintain discipline during the smallpox outbreak.
1922	<ul style="list-style-type: none"> ● The previous smallpox epidemic continued until August this year, which began ‘very quietly’ and affected the northern part of the town. There were 418 cases over 2 years, and 21.5% deaths, with the largest number among Malays (157 cases). 109 cases were unvaccinated cf. 248 vaccinated. Cases of smallpox from the rural area were moved to MH. ● Publicity was made in the press about dangers of smallpox. There was only 1 claim for a \$10 reward for reporting cases. The concealment of cases was the ‘principal cause’ of the extended duration of the epidemic – ‘the Malay were

Year	Development
	<p>the worst'. 'Mohammedans' objected the most strongly to hospital control and believed in their 'bomors' (as did some Chinese). But the bomors likely helped spread the disease. There was a full penalty of \$100 imposed on a number of failures to report cases. The cause of epidemic was not known, but it was not due to pilgrims returning from Mecca.</p> <ul style="list-style-type: none"> ● The control of the epidemic was due to vaccination work, cleansing of the town by Health Department, and the severe fines. The epidemic was not too serious as only a fifth of the patients died. There was assistance from the Chinese Chamber of Commerce and Mohammedan and Hindu Advisory Boards to advise the community to use MH, but this did not have much effect. The advisory boards were unable to determine the resistance to the hospital. A persistent rumour started that female patients were placed under the charge of male attendants, which provoked a signed petition. The Health Department was even willing to take on bomors on as ordinary ward attendants to make the hospital more acceptable to the community, but this failed as the Mohammedan committee wanted the bomors to have full control of the patients. It was suggested to go and vaccinate the people rather than rely and voluntary vaccination. ● There were 504 admissions (the most so far), 425 discharges, 97 deaths.
1923	<ul style="list-style-type: none"> ● The common belief was that plague was imported but the evidence suggested this was not so as rat plague was endemic in Singapore. A small rat campaign was started to collect information started in October and after a slow start, people became more cooperative. ● There were 282 admissions, 235 discharges, 38 deaths.
1924	<ul style="list-style-type: none"> ● Attap huts at Serangoon Road suspected of rat infestation and plague were burnt. The rat extermination campaign continued but was unlikely to be effective as rat population was a factor of food supply. Controlling the food supply was difficult in the back-to-back shophouses where the ground floors were filled with food supplies and where food was prepared in coolie houses or hawked without control. ● Smallpox vaccination continued but there was a need for better enforcement of compulsory vaccination. ● There were 361 admissions, 344 discharges, 20 deaths.
1925	<ul style="list-style-type: none"> ● More evidence from cases of plague that the disease was contracted in Singapore from rats, rather than imported. The disease was not likely epidemic because the amount of fleas in the rats remained small. ● There were 473 admissions, 444 discharges, 32 deaths.
1926	<ul style="list-style-type: none"> ● There were 425 admissions, 366 discharges, 36 deaths.
1927	<ul style="list-style-type: none"> ● No information available.
1928	<ul style="list-style-type: none"> ● No information available.
1929	<ul style="list-style-type: none"> ● No information available.

Year	Development
1930	<ul style="list-style-type: none"> ● This was a record year for the municipality: there were no cases of smallpox, plague and cholera reported; ‘We are to be congratulated on our luck’. ● Most typhoid cases were not notified. The disease was not due to flies but the ‘dirty fingers’ of hawkers. ● There were 577 admissions, 548 discharges, 33 deaths.
1931	<ul style="list-style-type: none"> ● There were again no cases of plague or cholera, but there were 3 cases of smallpox. The cases of typhoid were likely due to infected food, but there was no epidemic. ● There were 433 admissions (the lowest for 5 years), 372 discharges, 33 deaths. The most serious disease was diphtheria with 34.8% mortality. The largest ethnic group treated was Tamils.
1932	<ul style="list-style-type: none"> ● There were no case of plague or cholera but 8 cases of smallpox. Malay smallpox cases were prosecuted and fined. Typhoid in some cases was traced to itinerant hawkers, the disease being not concentrated in one area or period. ● There were 124 cases of diphtheria but this was underreported; the disease was increasing in severity and needed to be closely watched. Diphtheria remained the most serious disease with a 25.5% mortality; parents were delaying bringing their children to MH for treatment. ● There were 724 admissions (due to more chickenpox cases), 697 discharges, 38 deaths.
1933	<ul style="list-style-type: none"> ● There was 1 case each of smallpox and plague, but none of cholera. Cases of infectious diseases among the police were sent to MH. ● Again, typhoid was likely underreported. There was a typhoid outbreak, traced to a hawker who was infected, and an iced water seller. 33 hawkers selling at St. Joseph’s school were admitted to MH for examination as possible carriers. In another case at Emerald Hill, 208 hawkers living there were examined, and 1 carrier was found. The Municipal Health Officer P.S. Hunter had warned about the food-hawker in the last 10 years with little sympathy (and hostility in some cases). ● There were 1,160 admissions, 1,072 discharges, 75 deaths. On smallpox, plague and cholera: ‘it would seem that the role of the Hospital in the future will become less and less that of an isolation camp for these diseases and more and more than of a Hospital for the treatment of the ordinary infectious diseases of childhood and their sequelae’. ● Diphtheria was the most serious disease at MH, accounting for 3/5 of deaths.
1934	<ul style="list-style-type: none"> ● There was only 1 case of smallpox among 3 dangerous infectious diseases. Contacts were sent to St. John’s Island for quarantine. ● There had been no improvement in typhoid in the last 20 years. There were 7 such outbreaks in December. Many dysentery deaths due to typhoid were being made by visual certification. ● The remedy was easy: ‘a little determination and a little courage’, and ‘to have the absolute power to put the unlicensed hawker out of business almost

Year	Development
	<p>before he starts'. Current fines were inadequate and the economic hardships of itinerant hawkers were exaggerated. There was a need for stringent control over issue of hawker licences.</p> <ul style="list-style-type: none"> There were 930 admissions (398 chickenpox), 868 discharges, 61 deaths.
1935	<ul style="list-style-type: none"> There were 52 cases of smallpox, likely imported from China. There was little cooperation from Malays which further spread the disease. Itinerant hawkers were likely responsible for typhoid as before. A law was passed for stronger action against itinerant hawkers. Parents had become more aware of the risk and were forbidding their children from buying food on the streets. Infected cases should be sent to a hospital rather than remain at home where segregation was inadequate. But resistance to hospital admission was likely. There was a yearly quota of 9,600 hawker licences and every hawker was interviewed seen in person. The Municipal Ordinance was amended giving the police and Town Cleansing and Hawkers' Departments more powers of control, including impounding the hawkers' goods. But hawkers' use of scouts to look out for health inspectors was a source of frustration. There were 1,151 admissions, 1,105 discharges, 72 deaths. Diphtheria remained the most serious disease, with a 25% mortality. The vaccination of all babies before they were discharged from infant welfare centres should be considered.
1936	<ul style="list-style-type: none"> There was only 1 case of smallpox among the 'Big 3' diseases. There was no improvement with typhoid as stronger laws were being held up pending the passing of the new Food and Drug Regulations. Information was being collected on the food and drinks sold in the streets, especially ice-cream and iced drinks which were likely responsible for typhoid. Parents still took diphtheria lightly and many cases were admitted to MH in a moribund condition. It was worthwhile to consider the immunisation of babies in the infant welfare centres. There were 1,670 admissions (half from chickenpox and a fifth from mumps), 1,572 discharges, 78 deaths. Voluntary vaccination for diphtheria for infants with parental consent should be considered.
1937	<ul style="list-style-type: none"> Leprosy was added to list of notifiable diseases but tuberculosis was removed. There were no cases of the 'Big 3' diseases. Typhoid remained the same although number of itinerant hawkers fell as people found work in other trades. The new Food and Drug Regulations had yet to be passed. It was necessary to cease the government's laissez faire attitude towards hawkers. There was an increase in diphtheria cases. The state of diphtheria showed in particular the apathy of lower class Chinese parents. An experimental vaccination of infants in the infant welfare centres was suggested.

Year	Development
	<ul style="list-style-type: none"> There were 1,324 admissions (half from chickenpox), 1,246 discharges, 61 deaths.
1938	<ul style="list-style-type: none"> There were 2 cases of smallpox, but none of plague or cholera. There was a great increase in typhoid cases (740 cases, 202 deaths) due to the disease being locally endemic, but this was not an epidemic. There were 229 cases among school children, affecting a school in Coleman Street and more widely in Telok Ayer. The infection was likely due to several itinerant hawkers and manufacturers of ice -ream and iced drink. It was traced to a house in Amoy Street in which lived an ice-cream manufacturer. There was great reluctance among the people to send the patients to a hospital. Few homes could properly isolate patients as shown in the Municipality's surprise home visits. Orders were issued for all cases to be sent to a hospital. There were 281 hawkers examined at MH, with no carriers found other than the coolie residing in the Amoy Street house. The outbreak was an expensive one which disrupted the running of the Health Department. MH had to accept typhoid patients which it was not intended for. One achievement was that the Municipal Commission agreed to tighten the regulations on ice-cream manufacture: that no hawker be allowed to sell ice-cream unless it was obtained from licenced ice-cream maker. But there would likely be opposition to the regulations. There was an increase in diphtheria cases which would soon become an epidemic in Singapore. There was a highest mortality of diphtheria between one and five years of age. Tests in the year showed that children here had no natural immunity to the illness. The decision was taken in the year for the voluntary immunisation of children. The budget provided for the immunisation of infants under one year before they were transferred from the registers of infant welfare centres. There were 1,916 admissions, 1,843 discharges, 79 deaths. The increase was due to typhoid patients.
1939	<ul style="list-style-type: none"> There was 1 case of smallpox, but none of plague or cholera. The increased cases of typhus was due to more accurate diagnosis. There were fewer cases of typhoid, though some cases were likely not reported. Singapore compared unfavourably with Britain in typhoid and dysentery deaths. Typhoid was due to the increase in unhygienic preparation of ice-cream in the past few years. New regulations on the issue of hawker licences from previous year were now enforced. Only 2 plants in Singapore were able to safely produce clean ice-cream. There was a need for bacteriological standards for ice-cream production in Singapore to be closely supervised. But there were legal difficulties in making shops selling ice-cream that prove they had obtained it

Year	Development
	<p>from a licenced plant. The Municipal Commission decided that they would not compel shops to do so.</p> <ul style="list-style-type: none"> One extra Assistant Health Officer was appointed, making it possible to follow up with diphtheria contacts. The voluntary immunisation programme started in the year. Child patients were treated with Vitamin B because diphtheria was often complicated by beri beri. There were 1,508 admissions (178 from outside municipal limits), 1,418 discharges, 104 deaths. An ‘iron lung’ arrived at MH, donated by Lord Nuffield for diphtheria. There was an enormous strain on MH due to treatment of many infectious diseases other than the ‘Big 3’, e.g. diphtheria, measles, mumps, and whooping cough, which incidence had been increasing. The accommodation and staff were inadequate for the increased number of patients. A Committee was appointed to study the treatment and accommodation for infectious diseases of all sorts at MH. The high mortality of measles was due to belated admission of patients whose illness was complicated by bronchitis-pneumonia.
1940	<ul style="list-style-type: none"> No information available.
1941	<ul style="list-style-type: none"> Plans were made to build a 48-bed ward, foundations and services for two 24-bed wards, and 3 small observation wards at MH.
1942	<ul style="list-style-type: none"> No information available.
1943	<ul style="list-style-type: none"> No information available.
1944	<ul style="list-style-type: none"> No information available.
1945	<ul style="list-style-type: none"> No information available.
1946	<ul style="list-style-type: none"> There were 98 cases of smallpox and 126 cases of diphtheria at MH.
1947	<ul style="list-style-type: none"> The total number of infectious disease cases treated in MH during the year amounted to 1,448. This figure included a few contacts and query carriers.
1948	<ul style="list-style-type: none"> There was an anterior poliomyelitis outbreak in both in the municipal and rural areas, with 134 cases and 18 deaths. By race, the Chinese showed the highest case mortality, double of Europeans and Indians combined. Preventive measures included notifying the health authorities, isolating cases in MH, quarantining children for three weeks, and the surveillance of all adult contacts. Diphtheria immunisation was made available to the child population in Singapore. It was a prevalent and dangerous disease in children with 216 cases within the year and 41 deaths. The total number of infectious diseases cases admitted to MH was 1,798, which included typhoid, smallpox, and poliomyelitis.
1949	<ul style="list-style-type: none"> There were no cases of smallpox, plague or cholera, but poliomyelitis cases continued to occur (though fewer cases cf. the epidemic in 1948). The treatment of poliomyelitis placed a strain on MH but the hospital received assistance from government and university medical specialists. Poliomyelitis

Year	Development
	<p>was more prevalent among Europeans than Asians. The mechanical respirator was used for 3 polio cases.</p> <ul style="list-style-type: none"> ● Draft by-laws for the control of manufacture and sale of ice-cream were being considered for the control of typhoid. ● There was the lack of parental support for the immunisation of infants for diphtheria. ● There were 1,678 admissions, 1,585 discharges, 97 deaths.
1950	<ul style="list-style-type: none"> ● There were no cases of smallpox, plague or cholera. ● There was a typhoid outbreak, likely due to a hawker selling ice-cream in the town. MH and the Town Cleansing Department tried to stop this trade. ● The Municipal Commission and the Director of Medical Services agreed to treat residual paralysis cases at MH, where 30 beds would be set aside. ● Most poliomyelitis cases were of Chinese children under 5, and the illness was more fatal in babies under one. The use of Bragg-Paul pulsators was effective. Prolonged hospital treatment was required in most cases. ● 4 new respirators for poliomyelitis were purchased. A new iron lung was designed and made in the workshops of the Municipal Engineers' Department. ● There were 1,771 admissions, 1,625 discharges, 70 deaths. ● There was a mild enteric fever epidemic. ● The use of antibiotics against advanced cases of measles was effective.
1951	<ul style="list-style-type: none"> ● There was a remarkable freedom from many major infectious diseases in Singapore, such as smallpox plague and cholera, an absence of malaria, a decline in many respiratory infections, and improvement in the more lethal alimentary affections. A scheme for mass immunisation against smallpox on a voluntary basis was thought to be necessary because the population was dangerously under-vaccinated. ● 23 enteric/typhoid fever admissions had attended a common wedding dinner at Paya Lebar. Nine cooks and servers from the restaurant that supplied the dinner were detained for investigation as suspected carriers. ● The largest diphtheria admissions were recorded among the Chinese; the disease was most prevalent among the 2-5 years age group. The fatality rate was 19.4 percent and 61 cases died within 24 hours of admission. 107 (22.8 percent) diphtheria cases had tracheotomy; 52 (48.5 percent) died. ● Diphtheria was 'on the rise' with a large proportion of late admissions and a high mortality rate with deaths occurring within 24 hours after admission. Dr Ng See Yook attributed this to the 'sheer ignorance of the parents or poverty, as most of them belong to the working classes, as shown by the high number of unclaimed dead bodies which have to be buried by the hospital authorities'. ● There was a higher proportion of diphtheria admissions and deaths among children below the age of 5 years. Of the 469 cases, 320 were children under 5 years of age with a mortality rate of 97.8 percent. This group of children

Year	Development
	<p>received little or no medical attention as most of them were excluded from the care of the Infant Welfare Clinics being too old, and from the School Health Services as they were too young. They generally came under no health supervision except the care of the parents. All these cases had no diphtheria immunisation done.</p> <ul style="list-style-type: none"> ● Dr Ng called for more active health propaganda and a mass immunisation campaign against diphtheria. The lack of public response to diphtheria immunisation was a cause for concern. ● Poliomyelitis was ‘endemic’ in Singapore. A special post-polio unit was developed in the year – a very important and necessary venture since there had been a steady increase in cases. Patients were retained in MH for physiotherapy cases after the acute stage of the disease. Two full-time physiotherapists were employed for these patients. ● A grateful parent donated a small bathing pool about 5ft by 15ft by 2.5ft for the treatment of poliomyelitis cases. It was officially opened by the Acting President Municipal Commissioners on April 12, 1951.
1952	<ul style="list-style-type: none"> ● There were no epidemics. Singapore had not witnessed any quarantinable infection disease i.e. smallpox, plague, cholera, typhus, yellow fever or relapsing fever, in spite of the contiguity of territories which might breed these dangerous infectious diseases. ● Malaria was almost non-existent, apart from minor spikes due to careless building expansion exposing dangerous mosquito breeding or interfering with existing anti-malaria measures and imported infected labour. ● There was an increasing prevalence of mumps, measles and chickenpox, especially in schools. Students were kept away from school until they recovered. ● In April, five persons were admitted to hospital with typhoid after eating a catered dinner. The caterer who had supplied the food was the same one who had provided the dinner in December 1951, where 29 people fell ill. The caterer’s employees were examined once more and one of them, a temporary employee, proved to be a typhoid carrier. He had taken part in the preparation of both dinners, but was not previously examined. ● Anti-diphtheria immunisation began in August. The response was at first satisfactory but toward the end of the year, the numbers rapidly dwindled. The numbers reflected ‘a disturbing ignorance or apathy’. ● The government, the Services and the City Council participated in a mass voluntary vaccination campaign against smallpox, which began on 20 August. This was due to the risk of smallpox being imported from surrounding countries and five years had elapsed since the population had been vaccinated on a mass scale. More than 280,000 persons over the age of three were revaccinated by public vaccinators in the City area alone.
1953	<ul style="list-style-type: none"> ● There was no major epidemic of infectious diseases. There was complete

Year	Development
	<p>freedom from malaria.</p> <ul style="list-style-type: none"> ● Fatality rate of 2 percent for typhoid was a new record low. ● Poliomyelitis was endemic in Singapore but no outbreak occurred in the year. A ward at MH with 40 beds was utilised for the treatment of early cases of poliomyelitis. On average, 35 inpatient cases were undergoing physiotherapy. ● A self-starting electric power generator was installed to supply independent electricity to all iron lungs and the operating theatre. ● Diphtheria continued to be the most difficult public health problem. Even though there was a considerable drop in cases, the public still resisted the ‘two inoculation’ campaign. An extensive and sustained propaganda drive had to be repeated in the year to control the serious fatal condition in children. ● There were rumours that inoculation and blood tests would reduce birth rate and cause sterility. ‘Even in such an enlightened area as Singapore prejudice and ignorance still continue to play important parts in disease control and the Infant Mortality Rate’.
1954	<ul style="list-style-type: none"> ● No case of smallpox, plague or cholera was observed for the 7th consecutive year. ● An attempt by the City Health Department to trace the source of a typhoid outbreak in Tanjong Pagar was unsuccessful. 196 employees from ice-cream manufacturing firms tested negative for typhoid. ● The City and government health authorities carried out a mass inoculation campaign for children against diphtheria, but this did not reduce the number of admissions to MH. ● There were two deaths from poliomyelitis; one adult female died in an iron lung three days after admission. On average, 36 inpatient cases were undergoing physiotherapy. ● MH admitted 2,914 cases to its beds in 1954 compared to 2,049 in 1953.
1955	<ul style="list-style-type: none"> ● Typhoid fever, anterior poliomyelitis and diphtheria were still endemic. ● There was an outbreak of chickenpox among Indian labourers living in coolie quarters, though such cases were often not hospitalised at MH. ● In late August-early September, a household on Hindoo Road (a mother and four children) were admitted for typhoid. The source of infection could not be traced. ● 460 cases of diphtheria were admitted, a record high since the war. 41 out of 480 patients died. 17 patients died within 24 hours after admission. 81 cases were from the rural area. ● There was no poliomyelitis outbreak. One fatality had been in an iron lung for 5.5 years. The number of admissions was on the decline. The daily average receiving physiotherapy was 20 patients.
1956	<ul style="list-style-type: none"> ● There were no cases of smallpox, plague or cholera. ● 552 cases of diphtheria were admitted with 47 deaths, a mortality rate of 8.5 per cent. 20 cases died within 24 hours after admission which showed that

Year	Development
	<p>these cases were brought into hospital in the last stage of the disease. 111 cases required tracheotomy operation, of which 30 died. Practically all the tracheotomies had to be performed within the first or second hour of admission. Over 97 per cent cases had not been immunised against diphtheria. No fatal or severe cases occurred among the group immunised. Besides the above clinical cases, 188 contact diphtheria carriers with positive swab for <i>C. diphtheria</i> were also admitted for isolation and treatment.</p> <ul style="list-style-type: none"> ● Three-fourths of the diphtheria cases were from the overcrowded city area and poor illiterate families. To control this disease, it was the hope that the above information would enable the Health authorities to direct their beam of health propaganda more forcibly in that direction to achieve better results in the campaign of immunisation against this disease. ● The Infant Welfare Staff continued to try to persuade mothers to have their infants immunised against diphtheria. But they did not have much success until nearly the end of the year, when the Health Education Council, through the Public Relations Department, started putting out propaganda. There was quite a good response especially among children over a year old, of which 10,000 were immunised compared with over 5,000 in 1955. The response for the age group most vulnerable, between six months to one year, was still disappointing and did not increase over the previous year. There were plans for further propaganda next year. ● A ward at MH with approximately 40 beds was used for the treatment of late cases of poliomyelitis. There were 60 new cases and 6,237 repeat cases of the physiotherapy division at MH. ● MH admitted 3,831 cases compared with 3,312 in 1955, 2914 in 1954, 2049 in 1953 and 1,796 in 1952. ● The first case of Japanese B. Encephalitis 507 was admitted into MH. A Muslim boy of 9 years admitted with signs and symptoms of encephalitis and hemiplegia was serologically diagnosed as Japanese B. Encephalitis by Professor Hale of the University of Malaya. The patient was still under treatment in hospital. ● MH was the teaching hospital for infectious diseases for medical students from the University of Malaya. During the year, 90 medical students and 7 postgraduate students for the Diploma in Public Health attended courses in infectious diseases at MH.
1957	<ul style="list-style-type: none"> ● Enteric fever remained an endemic disease in rural Singapore. There were 33 cases in 1957; cf. 25 in 1956 in the rural area. Two minor outbreaks occurred during the year: (1) the Jalan Eunos area: There was a small outbreak of 7 cases in the early part of the year. Every effort to trace the source of infection failed; however, the spread of the disease was speedily brought under control and no more cases occurred. (2) Pulau Seraya: Three cases of typhoid occurred on the island with one death. They were all isolated and treated at

Year	Development
	<p>MH. The drinking well on the island was disinfected and intensive propaganda on hygiene conducted. It was not possible to trace any carrier. 200 out of the island's population of 350 were given anti-typhoid inoculation.</p> <ul style="list-style-type: none"> • The number of admissions for diphtheria was the highest since the last 10 years. The cases peaked in November. 19 cases died within 24 hours after admission and 110 cases required tracheotomy, of which 39 died. Nearly all cases had to be done within the first and second hour of admission, indicating the advanced stage of the illness before these cases were brought to hospital. Earlier admissions would have prevented many deaths from occurring. • The City Health Officer extended the immunisation campaign by arranging for an Assistant Health Officer to carry out an immunisation programme in addition to that done at the City Council and Government Infant and Maternal Welfare Clinics. • 52 cases of poliomyelitis were admitted to MH during 1957 and of these five died. The deaths occurred amongst Asian children, four under 8 years and one death in a girl of 11 years. • Chickenpox: As in previous years more than 60 percent of the admissions were Indians.
1958	<ul style="list-style-type: none"> • The largest outbreak of poliomyelitis in Singapore occurred. The epidemic began with 33 cases in September, 174 in October, 116 in November and 67 in December. Out of 404 cases, 314 were Chinese, 42 Indians, 34 Malays, 5 Javanese, 3 Europeans, 3 Eurasians, 1 Australian, and 2 others. • Most cases were reported in children below the age of five. Out of 404 cases, 278 were from the city. The mortality rate was 2.97 percent. The Type 1 poliomyelitis virus was found to be responsible for the epidemic. • There was extensive publicity on poliomyelitis in the press and radio. Any child with the slightest pain, or limb or alleged weakness was asked to be sent to hospital immediately. This put a great strain on the staff and accommodation at MH. 14 patients needed the iron lung machine; nine died. • The government started to use the sabin vaccine for against poliomyelitis. The Infant Welfare Department carried out the inoculation work. • In response to the high incidence of diphtheria in 1957, a mobile team was formed to provide immunisation to children. But the team had to suspend its work following the poliomyelitis epidemic in October. • MH admitted 3,679 cases in 1958 compared with 3,662 in 1957.
1959	<ul style="list-style-type: none"> • The poliomyelitis epidemic of 1958 tapered off into January 1959. 37 out of 64 cases were from the city area. • There was a small smallpox outbreak in April in Kampong Alexandra. An Indian boy had travelled to India where he contracted the disease. He remained concealed in a hut in the kampong until a Malay adult female was admitted and diagnosed at MH. This was a 29-year-old Malay woman who lived a short distance from the house of the primary case. In total, 10 cases

Year	Development
	<p>were diagnosed; two died. The 10 cases included two male Malays 46 and 24 years old male, a 20 year old female. On the same day, a 27 year old Indian male admitted to MH and died the following day. A few days later, a four-year-old male Malay child was brought to MH by his parents. Of the 10 smallpox cases in the epidemic, five were found as a result of house-to-house searches in Kampong Alexandra. Two had been admitted to MH prior to the confirmation of the first secondary case; three went to seek medical attention to doctors and were then discovered.</p> <ul style="list-style-type: none"> ● An island-wide vaccination was carried out. More than 562,558 people in the city were inoculated within 10 days. 240 contracts were quarantined on St John's Island, as well as all numbers of the staff and their families, the Wards being closed to all unvaccinated visitors. ● There was a small typhoid outbreak in October 1959 in a group of 21 people from three families who picnicked in Changi. Eight people contracted typhoid; others showed symptoms of fever. The carrier isolated in the owner of a sundry good shop selling ice-cream. ● 519 cases of diphtheria were admitted to MH. There were 23 deaths with a mortality of 4.43 per cent. As in previous years, the incidence was highest in children under five years. Forty-four cases required relief from respiratory distress by tracheotomy operation. 528 cases of diphtheria carriers were discovered. There continued to be poor public response to diphtheria immunisation. ● MH admitted 3,451 cases in 1959, compared with 3,679 in 1958, 3,662 in 1957, 3,831 in 1956, 3,312 in 1955 and 2,914 in 1954. It was the teaching hospital for infectious diseases for medical students from the University of Malaya.
1960	<ul style="list-style-type: none"> ● MH recorded the highest number of admissions ever. There were an average 192 patients, 4,924 admissions in the year, 4,857 discharges, 76 deaths and 1.48 mortality per cent per hundred treated. ● There was an explosive typhoid outbreak on Pulau Bukom Besar and the adjacent smaller islands in September 1960, where 53 people contracted the disease and were admitted to MH. About 100 hawkers and food handlers from Pulau Bukom were admitted to MH and screened for the typhoid carrier state. The source was found to be a carrier from a neighbouring island, who was a fish handler and who was excluded from handling food. ● In view of the high incidence of diphtheria, serious consideration was given to the introduction of legislation for compulsory immunisation which was anticipated to be enforced next year. The immunisation was confined to the use of triple antigen for all primary immunisation of infants instead of using Plain A.P.T or A.P.T plus whooping cough.
1961	<ul style="list-style-type: none"> ● 227 employees of ice-cream factories were sent to MH to check whether they were typhoid carriers. This was done every year.

Year	Development
	<ul style="list-style-type: none"> The Epidemiological Services was newly created and would start officially in 1962. The question of infectious disease control would come under this section and a more uniform system would be brought into action, coordinating MH, the School Health and Maternal and Child Health Services and the Epidemiological Section.
1962	<ul style="list-style-type: none"> 226 employees of ice-cream factories were sent to MH to check if they were typhoid carriers. The vaccination of children against poliomyelitis and diphtheria was implemented. A poliomyelitis immunisation campaign was launched in March and completed in November, using oral sabin vaccine in two doses for children from 6 months to 6 years of age. A total of 436,537 doses were administered. Immunisation against diphtheria was made compulsory for all children under the age of 12. A total of 58,594 children completed their primary immunisation with triple antigen.
1963	<ul style="list-style-type: none"> 203 employees of ice-cream factories, confectionaries, and distribution centres were sent to MH to examine if they were typhoid carriers. All were found to be free of typhoid. There were 2 outbreaks of cholera in Potong Pasir and Kampong Chia Heng. The outbreak of cholera in Singapore — the first re-appearance of this dreaded disease since the Pacific War — was a small one in comparison with the great epidemics recorded in history. The role of MH was secondary to the work of the Public Health Division in preventing the spread of cholera. In the first outbreak in May, City Public Health Inspectors were organised to investigate every house in the Potong Pasir area with the view to establishing whether any new cases were present. Cases of acute diarrhoea were removed to MH as suspect, but none of these were subsequently confirmed. As a public health measure with regard to contacts: all cases of vomiting and diarrhoea in other houses were removed to MH and all immediate contacts of these suspect cases were inoculated. They were placed under surveillance but not quarantined. The first patient in the second cholera outbreak in Nov/Dec 1963 was admitted to MH with diarrhoea and vomiting. Direct contacts were isolated in MH and a mobile team immunised the inhabitants of Kampong Chia Heng. Contacts were first isolated in MH but in later stages of the outbreak with large numbers of suspects hospitalised, contacts were isolated at St. John's Island. All carriers discovered were hospitalised and treated.
1964	<ul style="list-style-type: none"> 190 employees of all ice-cream factories and distribution centres were examined for typhoid at MH. Seven cholera carriers were admitted to MH during the year. Six were relatives of the cholera patients. The seventh was a Malay visitor from Trengganu who was found to be a carrier following routine stool examination

Year	Development
	of families of staff of the Trengganu General Hospital which was treating cholera cases. As he had left the State when the stool result was known, the Trengganu Health Authorities informed MOH in Singapore and he was traced and admitted to MH for investigation and treatment.
1965	<ul style="list-style-type: none"> ● A typhoid outbreak occurred at Chung Cheng High School, which was traced to an ice-water hawker known as 'Little Pig'. He had fallen ill but continued to sell ice-water which he had contaminated with <i>Salmonella typhi</i>. Later he became more ill and stopped selling, but the school children whom he had infected subsequently developed typhoid. When the outbreak occurred, he was not present when the hawkers at the school were rounded up for typhoid carrier examination. He was ultimately traced and admitted to hospital in a very ill condition with typhoid fever. ● Two cases of malaria were detected in MH where they had been admitted for typhoid.
1966	<ul style="list-style-type: none"> ● Emergency Immunisations: the Maternal and Child Health Service was called to deal with diphtheria immunisations for children of staff residents of TTSRH and MH, following the occurrence of diphtheria cases amongst children in these families.
1967	<ul style="list-style-type: none"> ● 217 employees and ice-cream handlers in the city and rural districts were examined at MH for typhoid. None were found to be a typhoid carrier. ● Singapore had the lowest record of poliomyelitis since the massive outbreak in 1958. ● Physiotherapy services at MH were withdrawn because of the shortage of staff. Plans were made to resume part-time service at MH in Jan 1968 when the necessity arose. During the past 1.5 years, patients requiring physiotherapy care were transferred to St. Andrew's Orthopaedic Hospital. ● Infectious diseases showed a healthy decline except for haemorrhagic fever. ● Notifiable diseases were divided into two broad categories under the Quarantine and Prevention of Disease ordinance: a) Dangerous infectious diseases which were quarantinable included smallpox, plague, cholera, epidemic, or louse-borne typhus and yellow fever; b) minor infectious diseases included anthrax, endemic typhus, cerebro animal fever, acute poliomyelitis, chickenpox, diphtheria, enteric fever, erysipelas, leprosy, puerperal fever, scarlet fever, tuberculosis and malaria.
1968	<ul style="list-style-type: none"> ● A notable feature of the year was the marked decrease in the number of admissions of diphtheria cases at MH, indicating a break-through in the campaign against diphtheria. 54 cases were admitted compared with 207 cases in 1967. With only two deaths in 1968, the case fatality rate was 3.7 per cent. However the proportion of severe cases remained high, 20 cases being classified as severe (laryngeal and pharyngeal) diphtheria.
1969	<ul style="list-style-type: none"> ● No information available.

Year	Development
1970	<ul style="list-style-type: none"> There was a small outbreak of typhoid fever on Pulau Tekong in December. 26 persons were admitted, 11 cases confirmed. No carrier was detected among the persons examined. 162 suspects and contacts admitted to MH and 76 cases confirmed as typhoid in the Geylang Serai area in Jan. Investigation of hawkers and contacts resulted in the detection of 3 carriers with positive stools. Infectious diseases like diphtheria had declined over the last 3 years.
1971	<ul style="list-style-type: none"> There were 2,743 admissions and 12 deaths, 1,490 outpatients treated at MH. Outbreak of salmonella gastroenteritis beginning in September which affected infants and young children. 155 cases were admitted with one death.
1972	<ul style="list-style-type: none"> No information available.
1973	<ul style="list-style-type: none"> No information available.
1974	<ul style="list-style-type: none"> No information available.
1975	<ul style="list-style-type: none"> There was a high number of typhoid admissions to MH, especially during Jan to March, and Nov to Dec. 508 cases admitted, an increase of nearly 70% from the previous year. Ten cases of cholera, biotype El Tor, serotype Ogawa were admitted. 334 family contacts and food handlers were examined for the carrier state. Two cholera carriers were detected during the course of the exercise. For the first time, there was no admission of diphtheria during the year. Total of 9,974 admissions and 1,027 outpatient attendances at MH. The Department of Dermatology comprised Middle Road Hospital and Trafalgar Hospital. Inpatient care was provided at MH exclusively for skin patients in one male and one female C Class ward. Skin and leprosy patients requesting A and B Class accommodation were admitted into the A and B Class wards of MH.
1976	<ul style="list-style-type: none"> There were 6,591 admissions and 1,958 outpatient attendances at MH. 135 cases were admitted for typhoid fever, the lowest recorded since 1968. 2,892 persons, mainly hawkers and food handlers, were examined for typhoid carrier state. 6 typhoid carriers, 62 salmonella and shigella carriers were detected. There were no admission of diphtheria and cholera cases. 679 cases of rubella mainly among NSmen were hospitalised. 24 persons with viral hepatitis were admitted.
1977	<ul style="list-style-type: none"> There were 9,619 admissions and 2,312 outpatient attendances at MH. 11 non-fatal cases of El Tor Cholera were admitted. There were 201 admissions for typhoid fever of which 191 were acute cases and 10 were convalescent cases detected among contacts. Rubella admissions at MH remained high at 519. Two cases of paralytic poliomyelitis were admitted. One was a male adult Australian infected during his travel to Thailand and Malaysia, and the other

Year	Development
	<p>was an Indonesia girl who developed the disease in Indonesia and came to Singapore for treatment.</p> <ul style="list-style-type: none"> ● There were 47 malaria cases.
1978	<ul style="list-style-type: none"> ● There was an unusual event in the admission of 86 cases of El tor Cholera. This was the second highest number of admissions since 1963. The only localised outbreak was in the Temple Street area in Sept 1978. 31 cholera carriers were detected among contacts of confirmed cases.
1979	<ul style="list-style-type: none"> ● 7,366 cases of acute infectious diseases were admitted to MH. This was a decline of 25.7% as compared with 1978 when an outbreak of rubella gave rise to an abnormally high number of admissions. ● There was an unusual occurrence in the admission of 59 cases of para-typhoid A and 128 cases of bacillary dysentery, the highest number recorded for both diseases in the last 10 years. ● The annual rise in admissions for non-specific gastro-enteritis continued.
1980	<ul style="list-style-type: none"> ● There were 5,989 admissions to MH. ● There were 18 cases of cholera, 202 typhoid fever, 186 viral hepatitis. ● There was a large number of admissions for viral hepatitis due to two outbreaks of the disease in Singapore during the year. ● A total of 2,817 persons comprising food handlers, contacts of typhoid patients and convalescent typhoid patients were screened by MH.
1981	<ul style="list-style-type: none"> ● Since 1973, MH had admitted patients with dermatological problems and STDs requiring inpatient treatment. ● The total number of patients admitted to MH increased by 28.3% from 6,748 cases in 1980 to 8,657, comprising 7,744 cases of infectious diseases and 913 cases of dermatological problems and STDs. ● 5 cholera cases were diagnosed in a squatter area in Akyab Road. This area was demolished and the residents resettled in HDB flats. ● There were 2 typhoid outbreaks in March and May (the former was traced to a sugar cane juice source, the latter to children in a primary school). ● 51 patients were admitted for malaria, who had developed the disease from the neighbouring countries. ● There were outbreaks of rubella in various army camps and training centres. An average of 70 cases was hospitalised monthly from July to December. ● 90 cases of measles were admitted (the lowest since 1975). The decrease was probably the result of the Measles Immunisation Programme which was intensified in 1980. ● Diseases of greatest public health importance: cholera – 34 cases, typhoid fever – 191, salmonella gastroenteritis – 113, and rubella – 474.
1982	<ul style="list-style-type: none"> ● The most commonly notified communicable diseases were tuberculosis (2,179 cases), viral hepatitis (426), malaria (282), dengue/dengue haemorrhagic fever (216), and typhoid and paratyphoid fevers (174). ● There was one imported case of poliomyelitis.

Year	Development
	<ul style="list-style-type: none"> Diphtheria made a re-appearance after an absence of 4 years. Of the 6 cases reported, 2 were imported and the other 4 were unvaccinated children of foreign workers in Singapore. MH worked in close coordination with the Ministry of the Environment in the screening and investigation of infectious diseases. There was an increase of the number of patients admitted to MH – 17.1% from 8,657 in 1981 to 10,140, comprising 9,147 cases with acute infectious diseases and 993 with dermatological and sexually transmitted diseases. Outbreaks of rubella, measles, and cholera contributed largely to the increase in admissions. 48 people were admitted for cholera – 37 were construction workers from Changi and Marine Parade. This was traced to 2 carriers working in the canteen at the Marine Parade construction site. 44 cases of malaria contracted the infections overseas. 144 patients were treated for dysentery, 88 had shigella infection. The number of admissions for measles rose significantly from 80 cases to 320, for rubella from 476 to 770. Diseases of public health importance: typhoid fever (164 cases), viral hepatitis (74), dengue/dengue haemorrhagic fever (32), whooping cough (7).
1983	<ul style="list-style-type: none"> There was no major outbreak of infectious diseases during the year. There was a 17% decrease in the number of admissions from 10,140 in 1982 to 7,382, of which 885 were dermatological problems or STDs. 2,692 attendances were registered for outpatient follow-up clinic. Diseases of public health importance: cholera (13 sporadic cases), enteric fever (117 typhoid fever), viral hepatitis (144), malaria (66), measles (129), dysentery (106). As from July, all cases of acute viral hepatitis requiring hospitalisation were referred to MH. There were 3 imported cases of diphtheria. 1 imported case of paralytic poliomyelitis was warded. 3,122 cases were screened for typhoid, with 6 carriers detected. None were food handlers. 5 cholera carriers were found among the contacts examined.
1984	<ul style="list-style-type: none"> Middle Road Hospital had inpatient facilities at MH for patients with dermatological conditions and STDs, and leprosy. Two wards in MH, with a bed complement of 44, admitted 887 such patients as against 820 in 1983, an increase of 8.1%. Bed occupancy was 62.7%. The Virology Section worked with MH and the Ministry of Environment to determine the epidemiology of non A, non B hepatitis in Singapore, and to compare the clinical severity of the three types of viral hepatitis.
1985	<ul style="list-style-type: none"> 1 Jan 1985, the former MH was incorporated into Tan Tock Seng Hospital as the Communicable Disease Centre. CDC was a 160-bedded establishment providing inpatient and outpatient services for the treatment of infectious diseases.

Year	Development
1986	<ul style="list-style-type: none"> ● A ward at DCD was made ready in March to provide inpatient treatment for AIDS patients. It admitted its first patient in 8 Sept. CDC and Middle Road Hospital continued to provide outpatient care for AIDS patients and carriers.
1987	<ul style="list-style-type: none"> ● 10 more persons were found with HIV, with a total of 20 HIV positive cases. 4 cases died, all of whom developed AIDS within a year of prognosis. ● The main communicable diseases were viral hepatitis (752 cases), dengue fever/DHF (436 cases), malaria (165 cases) and typhoid and paratyphoid fever (132 cases).
1988	<ul style="list-style-type: none"> ● There was no major outbreak of communicable diseases. The incidence of imported malaria increased by 39.1% compared with the previous year. ● There was a 43.9% drop in the number of reported dengue fever/DHF cases. ● Foodborne infections: 19 sporadic cases of cholera and 45 cases of indigenous typhoid were notified. ● The AIDS Awareness Fortnight was held in Nov to Dec 1988. An AIDS 'Helpline' telephone service was established and counselling service was expanded to provide the public with greater accessibility to anonymous free counselling of the disease.
1989	<ul style="list-style-type: none"> ● The infectious disease situation was fairly stable during the year. ● There were 203 cases of malaria, all imported. This was a drop of 11% compared to 1988. ● There was a fourfold increase in dengue fever/dengue haemorrhagic fever with 944 cases reported. An outbreak occurred during May to Sept, but was quickly brought under control through vector control measures. ● Viral hepatitis remained a major public health problem with 439 cases, including 5 deaths. 66.2% of the cases were caused by the Hepatitis B virus. ● Among the major childhood infectious diseases, measles showed a 24% decrease from 192 cases in 1988 to 146 cases in 1989. The number of chickenpox cases increased from 8,711 to 17,087 cases. One imported diphtheria case was reported. ● 10 more cases of HIV were diagnosed, bringing the total to 44. 5 males with AIDS died during the year, bringing the total deaths to 9. Health education on AIDS continued to be emphasised.
1990	<ul style="list-style-type: none"> ● There were 17 new cases of HIV infection. As of 31 Dec 1990, there were a total of 61 HIV-infected Singaporeans. Among these were 23 AIDS cases, one with AIDS-related illness, and 37 asymptomatic carriers. 6 AIDS patients had died, with a total of 15 deaths. ● MOH assisted in the control of AIDS by setting up the AIDS Task Force which advised the ministry on medical and scientific matters relating to AIDS, and the National Advisory Committee on AIDS which gave community feedback on the AIDS education programme. There was public education on AIDS and counselling of persons with high-risk activities.

Year	Development
	<ul style="list-style-type: none"> To help in the formulation of the AIDS policy, 3 studies were conducted: a knowledge of AIDS transmission and attitude and practice of protected sex among commercial sex workers; on sexual behaviour and condom usage among patients attending a public STD clinic, and to assess HIV and other STD infection rates among commercial sex workers.
1991	<ul style="list-style-type: none"> Dengue fever/dengue haemorrhage fever remained a public health concern. There was an increase from 1,733 cases in 1990 to 2,179 in 1991. The outbreak was precipitated by the declining level of herd immunity of the population following more than a decade of low dengue transmission, and the localised build-up of Aedes mosquitoes. There was a small number of cholera cases (34, cf. 26 in 1990), while enteric fever decreased from 231 cases in 1990 to 132. There were 42 new cases of HIV. As of 31 Dec 1991, there were a total of 103 HIV cases, comprising 35 AIDS cases, 2 AIDS-related illness, and 66 asymptomatic carriers. 8 AIDS patients died during the year, bringing the total deaths to 23. The Department of Disease Control organised a national workshop on AIDS, sponsored by United Nations Development Programme, which examined the social, economic and the legal implications of AIDS for Singapore. The workshop was attended by representatives from government agencies, including MHA, MFA, MOE, STPB, EDB, HDB, Civil Aviation Authority of Singapore, Ministry of Labour, and NGOs. A public forum on ‘STD and AIDS’ (conducted in both English and Chinese) was held in July 1991. The Department of Disease Control produced a handbook on the ‘Prevention of HIV Transmission in the Health Care Setting’, which contained guidelines on the universal precautions for healthcare workers to protect themselves from HIV infection in the workplace. The handbook was distributed to all doctors, dental surgeons, nurses, and lab technicians in Singapore. A seminar, ‘AIDS: Sharing the Challenge’ on the control and implications of AIDS was held for doctors and dental surgeons in December.
1992	<ul style="list-style-type: none"> Three departments of TTSH involved with infectious diseases, the Epidemiology Department, Department of Communicable Diseases and Department of Tuberculosis Control merged to form the Communicable Disease Centre on 1 February 1992. The Centre specialised in the monitoring, prevention, control, and treatment of infectious diseases including tuberculosis, leprosy, chickenpox, measles, rubella, mumps, malaria, diarrhoea diseases, hepatitis B, and HIV infection. The Centre also provided consultancy services on hospital infectious to other government and restructured hospitals. Chickenpox cases increased by 79% to 32,060.

Year	Development
	<ul style="list-style-type: none"> Dengue fever/dengue haemorrhagic fever rose by 42% to 2,878 cases. The two outbreaks were precipitated by the decline in level of herd immunity of the population. All 221 malaria cases diagnosed were imported. 55 new cases of HIV were reported. Total number reported from 1985-1992 was 158. These comprised 53 AIDS cases, 1 AIDS-related illness and 104 asymptomatic carriers. 14 AIDS cases died during the year. Total deaths: 36. The childhood immunisation programme included immunisation against TB, diphtheria, pertussis, tetanus, poliomyelitis, measles, mumps, rubella and HEP B. Immunisation rate was over 90% except for Hep B which was 80%.
1993	<ul style="list-style-type: none"> Chickenpox increased by 46% with 46,830 cases. The rise was partly due to increased awareness of the disease among Singaporeans with more patients seeking treatment. Dengue cases fell to 946. There were 3 outbreaks of malaria; of the 354 notifications, 58 were indigenous cases. There were 7,692 cases of STDs notified. The 3 main STDs were gonorrhoea (34%), non-gonococcal urethritis (17%) and syphilis (12%). Other STDs that were reported include chancroid, genital herpes, genital warts, and chlamydia. There were 64 new HIV cases and 22 cases of AIDS reported. Total number of HIV cases was 222, comprising 75 AIDS cases and 147 asymptomatic carriers. Total number of deaths was 54.
1994	<ul style="list-style-type: none"> An International Travel Clinic was set up at CDC to cater to the health needs of travellers, such as pre-travel advice on immunisation, preparation of personal medical kits, and ailments after trips overseas. The Government Vaccination Centre, managed by the School Health Service at the Institute of Health, was merged into the International Travel Clinic in Dec to provide a one-stop service for travellers. Number of notifications for chickenpox decreased 10% to 39,558. Dengue fever showed an increase of 31% to 1,239 cases. There were 277 reported cases of malaria, of which 265 were imported. There were 7,242 cases of STDs notified, a decrease from 236 cases per 100,000 to 215 cases per 1000,000. The 3 main STDs notified were gonorrhoea (32%), non-gonococcal urethritis (29%) and syphilis (14%). There were 86 new cases of HIV and 48 cases of AIDS. There was a total of 308 cases of HIV reported since the first case detected in 1985. Among these were 123 AIDS cases and 185 asymptomatic carriers. 27 AIDS patients died in the year, bringing the total deaths to 84.
1995	<ul style="list-style-type: none"> The number of chickenpox cases decreased by 14% from 39,558 the previous year to 34,066 in 1995. Reported cases of dengue increased by more than 60% with 2,008 cases.

Year	Development
	<ul style="list-style-type: none"> ● There were 316 reported cases of malaria, including 304 imported cases. ● The Infection rate for STDs decreased from 215 cases per 100,000 to 177 per 100,000 in the past year. ● There were 111 new cases of HIV and 56 cases of AIDS. There was a total of 419 cases of HIV reported since the first case detected in 1985. Among these were 62 AIDS cases and 233 asymptomatic carriers. 32 AIDS patients died in the year, bringing the total deaths to 124.
1996	<ul style="list-style-type: none"> ● The number of chickenpox cases doubled to 49,763. ● Dengue rose by 56% to 3,128 cases. ● There were 364 cases of malaria, including 328 imported cases. ● STDs decreased from 1,000 new cases per 100,000 in 1980 to 154 cases per 100,000 cases in 1996. ● The key message in the National AIDS Control Programme was to remain faithful to one's spouse or partner and to avoid casual sex. ● There were 139 new cases of HIV and 90 cases of AIDS. There was a total of 558 cases of HIV reported since the first case detected in 1985. Among these were 97 AIDS cases and 275 asymptomatic carriers. The total deaths was 186.
1997	<ul style="list-style-type: none"> ● Under the Infectious Diseases Act, jointly administered by the Ministries of Health and the Environment, all medical practitioners and laboratories were required to notify the Ministries of specified infectious diseases under the Act. This was to enable the proper monitoring and implementation of necessary control measures to stem the transmission of the diseases. ● The number of chickenpox cases decreased by 44% to 27,723 cases in 1997. ● Dengue rose by 37% to 4,300 cases. ● There were 421 cases of malaria, including 368 imported cases. ● There was a mild outbreak of measles due to the accumulation of unimmunised individuals. There were 977 cases of measles in the first half of 1997 compared to 151 cases in 1996. To control the outbreak, MOH implemented the 'catch up' measles vaccination programme in July 1997. Under this programme, all students from secondary schools, JCs and polytechnics were advised to be re-vaccinated. ● Various aspects of tuberculosis, HIV and staphylococcal infections were investigated, mainly to improve diagnosis capability. Hep B virus studies, initiated several years ago, were beginning to yield results. The genome for some of these virus strains had been worked out and was being patented. ● There were 173 new cases of HIV and 88 cases of AIDS. There were 2 cases of HIV infection through blood transfusion.
1998	<ul style="list-style-type: none"> ● There were 27,183 chickenpox cases in 1998. ● Dengue rose by 22% with 5,258 cases. ● There were 405 cases of malaria, including 369 imported cases. ● Measles saw a significant decline from 1,413 cases to 1,138 cases.

Year	Development
	<ul style="list-style-type: none"> There were 199 new cases of HIV/AIDS. Total cases among Singaporeans was 930. Of these, 423 were asymptomatic carriers, 196 had AIDS and 311 had died. More males contracted the disease: 830 cases (89.2%). Among the males, the majority were single (67%). Among the females, the majority were married (73%). 96% contracted the disease through the heterosexual route. 85% were aged 20-49 years at the time of diagnosis. Incidence of STDs declined from 1,000 cases per 100,000 population in 1980 to 160 cases per 100,000 population in 1998. Gonorrhoea (29%), syphilis (20%) and non-gonococcal urethritis (18%) continued to be the 3 most common STDs notified in Singapore. Main focus of the National STD Control Programme, administered by the Department of STD Control, was early and adequate treatment of the infected, contact tracing and health education for high-risk groups. STD patients were counselled and educated on the prevention and transmission of the diseases, and the importance of proper and adequate treatment. Number of cases of acute Hep B remained low: 205 cases, or an incidence rate of 6.5 cases per 100,000 population. Control measures for Hep B included immunisation, infection control in health care establishments and the routine screening of blood donors to prevent transmission. The main thrust in the control of Hep B was immunisation. The last indigenous case of paralytic poliomyelitis in Singapore was reported in 1978. A high poliomyelitis vaccination coverage for infants of around 90% in the last decade and close surveillance of the disease had contributed to the eradication of poliomyelitis in Singapore. There was a significant decline in the number of measles cases with 118 cases in 1998 compared to 1,413 in 1997, due to the 'catch up' measles immunisation programme.
1999	<ul style="list-style-type: none"> Chickenpox in 1999 totalled 31,592 cases, 16% higher than 1998. Dengue decreased to 1,355 cases (a decrease of 75%). Reduction could be attributed to the reorganisation of the vector control operations and the use of the Geographical Information System to track the distribution of Aedes mosquitoes and cases. There were 316 reported cases of malaria, including 306 imported cases. The AIDS education programme emphasised the risk of casual sex. 2 TV dramas based on experiences of actual HIV/ AIDS cases titled 'Moment of Truth' and 'Dear Diary' were telecast in English, Malay and Tamil to educate the public about the dangers of HIV/AIDS and to discourage high-risk sexual behaviour. Advertisements in various magazines publicised the AIDS and STD helpline as well as the testing sites for the HIV antibody test. AIDS education materials and messages were placed in ferry terminals and ferries.

Year	Development
	<ul style="list-style-type: none"> ● A video ‘No Cure for AIDS’ was produced to educate foreign workers in Singapore. 8 <i>getai</i> shows were conducted to disseminate the AIDS education message to the Chinese-speaking heartlanders. ● A training course for Malay health promotion facilitators from drug rehabilitation centres and halfway houses was conducted to provide them with knowledge of AIDS and how to conduct programmes for their inmates and residents. ● AIDS education programmes consisting of talks, exhibitions, video screening and distribution of print materials were conducted in various workplaces. ● 1,136 cases of HIV infections had been reported since 1985. Of these, 481 were asymptomatic carriers, 272 had AIDS and 383 had died. 90% of the cases were infected through the sexual route. Most of the cases were single males aged 20-49. ● STDs declined to 162 per 100,000 population in 1999. ● Mumps vaccination was carried out in 1999. The number of cases decreased from 1981 in 1992 to 674 in 1997. However, in the last 2 years there was an increase in cases to 1,183 in 1998 and 6,381 in 1999, due to the low protection conferred by the Rubini strain mumps vaccine used during 1993-95. The vaccine was de-registered in May 1998. ● Nipah virus outbreak. March 1999, 11 abattoir workers who had direct contact with infected live pigs fell ill with encephalitis or pneumonia. One of the workers subsequently died. This outbreak was linked to a similar outbreak in Malaysia, caused by the Nipah virus. Measures taken included suspension of all imports of live pigs from Malaysia and Indonesia and the temporary closure of the two local abattoirs. Epidemiological surveillance was intensified to detect other unreported cases among abattoir workers, home contacts, labs, medical and veterinary personnel. Screening of dozens of anxious workers with occupational animal exposures was conducted at Specialist Clinic J (SOC J) at CDC. During the outbreak, all medical practitioners were alerted to look out for abattoir workers with febrile illness and signs and symptoms of respiratory or neurological disease.
2000	<ul style="list-style-type: none"> ● Hand, Foot and Mouth Disease, Legionellosis and Nipah virus infection were added to the Infectious Diseases Act on 1 Oct 2000. ● Oct to Dec 2000, there were 3,362 Hand, Food and Mouth diseases cases and 19 cases of Legionellosis. No cases of Nipah virus infection were reported. ● There were 24,074 cases of chickenpox, a reduction of 24% from 1999. ● Dengue continued to decline to 673 cases, a marked decrease of 50%. ● New TB cases decreased by 10% to 2,210 in 2000. ● All immunisations except Hep B were given free at the polyclinics and schools. Childhood Immunisation Programme included TB, diphtheria, pertussis, tetanus, poliomyelitis (Sabin), measles, mumps, rubella, Hep B.

Year	Development
	<ul style="list-style-type: none"> ● Singapore was certified free of poliomyelitis on 29 Oct 2000 by WHO. After the Americas, this was the second region in the world to have achieved poliomyelitis-free status. Poliomyelitis immunisation which was part of the National Childhood Immunisation Programme received a high level of coverage over the past 3 decades. In 2000, the coverage for poliomyelitis in infants was 90%. ● 2,511 cases of HFMD were reported. The majority of the cases occurred in the first two weeks of Oct. 4 children died. Advice from inter-ministry and multi-disciplinary HMFD Taskforce: immediate precautionary measures were taken to break the chain of transmission with the closure of 557 childcare centres and 440 kindergartens in Singapore for about 2 weeks. Enteravirus 71 (EV71) was associated with HFMD, and was the main cause of this outbreak. ● Singapore was well-prepared to handle the outbreak. Availability of standard operating procedures, prepared well before the outbreak, and joint efforts by parents, staff of childcare centres and kindergartens, medical practitioners and staff at hospitals and clinics enabled the HMFD taskforce to interrupt the chain of disease transmission rapidly and control the situation. ● There were 117 cases of Hep B in 2000. In 2001, MOH implemented a 4-year immunisation programme for students born before 1987 and not covered with Hep B immunisation under the Childhood Immunisation Programme. ● Total HIV cases since 1985 was 1,362 as of Dec 2000. 556 were asymptomatic carriers, 328 had AIDS, and 478 had died. A multi-sectoral and multi-disciplinary approach was adopted to disseminate the main message to the public – remain faithful to one's spouse and to avoid casual sex and sex with prostitutes. AIDS Education Programme's slogan in 2000 was 'to be safe, always use a condom. To be sure, abstain from casual sex'. Educational activities like talks and exhibitions were conducted throughout the years in schools, the community, workplaces and healthcare institutions. <i>Getais</i> informed the audience about how HIV infection was spread and dispelled myths and misconceptions about the disease through skits, songs and oral quizzes. The Cruise Centre, Tanah Merah Ferry Terminals and ferries carried educational pamphlets and posters on HIV/AIDS. ● STDs declined to 156 per 100,000 population in 2000. More males, usually in the younger 25-29 age group, were affected.

3.5 Stigma towards CDC and infectious diseases

An important finding of our research was that social stigma towards infectious diseases is an integral part of the long history of CDC. This is evident in the public reactions to AIDS and SARS detailed above, but also to infectious diseases in general.

Dr Edmund Monteiro (oral history, 2018), who was the Medical Superintendent of MH over the early AIDS period, felt that the hospital's change of name to CDC during the merger of

MH and TTSH highlighted the term ‘communicable disease’ and contributed to the public’s fear of CDC.

Ms Iris Verghese (oral history, 2019) recalled that many people were frightened of CDC and that the Black Lion crest signified death. HIV patients had to hide their illness from others.

Ms Cheong Yoke Lin (oral history, 2019) related that while patients of CDC generally received visits by their families, the AIDS patients had fewer visitors, ‘because a lot of people think, “Infectious hospital, better don’t come, wait I get infection”’.

During the SARS outbreak, Ms Dorothy Gomez (oral history, 2019) remembered that CDC became even more quiet than usual, with many taxi drivers and even bus drivers refusing to stop there.

A/Prof Ooi Peng Lim (oral history, 2019) recalled that healthcare workers encountered significant stigmatisation during the SARS outbreak. There were cases of nurses being avoided on public transport and foreign nurses being evicted by their landlords.

However, CDC’s nurses told personal stories of how stigma could be countered by understanding of infectious diseases and family support.

When Ms Dorothy Gomez (oral history, 2019) started to work in Ward 76, she was ‘a bit hesitant’ as she had not worked with AIDS patients before. But she overcame her fear when her husband, also a nurse, supported her in her work. During the SARS outbreak, her mother-in-law was worried as Ms Gomez had two young children at the time. Again, her husband was understanding, simply asking her to be mindful of hygiene. She felt sorry for other nurses who had to care for the SARS patients, but no one shirked their work. The nurses at CDC looked out for one another with regards to hygiene and safety. The support from the management for the nurses was fantastic.

When Ms Meeravathy PS (oral history, 2019) was first posted to MH in the 1970s, her father did not want her to work there due to the presence of infectious diseases. But he changed his mind when he realised nurses had to change their clothes and shower before they came home.

Ms Akhterun Nisha (oral history, 2019) related her fear when a mosquito bit an AIDS patient at CDC, but her colleague Jeff Thayala, who was a trained AIDS nurse, assured her that ‘mosquitos here are all friends to us’.

These personal accounts point to effective ways to combat the stigma against infectious diseases.

4 The pavilion wards of CDC are rich with history.

The buildings of CDC were built at various points in Singapore history in response to new

circumstances, namely,

- Originally in 1913, the hospital had 3 sections for the ‘Big 3’ notifiable infectious diseases: smallpox, bubonic plague and cholera; 6 observation and discharge wards for cholera and plague; the Administration Block; a range of staff housing along the southern side; and other facilities such as the mortuary.
- After 1913 to the 1920s, to compensate for the original curtailed plan and new needs, a diphtheria ward was built in 1919, a cholera ward in 1921 and a smallpox ward in 1922. More staff housing was also built.
- There were plans for a 48-bed ward and other improvements in 1941, but they were disrupted by the outbreak of war.
- During the Second World War and Japanese Occupation of Singapore (1942-1945), H ward, a temporary ward, was built.
- In the post-war colonial period from 1945 to the 1950s as part of the expansion of medical services in Singapore, the Cubicle Ward was built in 1956. More staff housing and facilities were also built, acquired or expanded.
- In the post-independence period: Ward 72 in 1971, a paying ward with air-conditioning, was built for higher-income patients. In more recent years, cabin wards Wards 91-94 and CDC 2 (near TTS) were built in response to the 2003 SARS outbreak, while Block 890 was built in response to the 2014 Ebola outbreak. The Administration Block was redeveloped in 1967 and expanded in 1992.

The pavilion wards and other buildings of CDC are vested with Singapore’s rich medical heritage, having treated, isolated and cared for patients of various infectious diseases outbreaks at different junctures in Singapore’s history. The diseases ranged from the ‘Big 3’ of notifiable infectious diseases in the beginning (smallpox, plague and cholera) to influenza, typhoid, chickenpox, diphtheria, and poliomyelitis in the colonial period, and these and skin and venereal diseases, AIDS, dengue, Nipah, and SARS after independence.

4.1 The layout

The unique sprawling layout of CDC was based on the ‘pavilion-ward’ system which reflected prevailing thinking on sanitation and infectious disease control at the dawn of the 20th century. This system had its roots in the French hospital system in the 18th century and was popularised in Britain by medical practitioners and architects such as John Roberton, George Godwin, Florence Nightingale (hence the commonly known ‘Nightingale ward’), and Henry Currey in the mid-19th century.

The basic concept of the pavilion-ward system was a decentralised hospital layout, with detached or semi-detached wards separated from one another by a considerable distance. As architectural historian Jeanne Kisacky explained, ‘The pavilion-ward hospital of the 1890s was a collection of interdependent but physically components, each designed to meet the specific functional requirements of the activities it houses’. The purpose was to isolate

different cases of infectious diseases and prevent the spread of germs to other patients, while also allowing for beneficial air circulation and exposure to sunlight. The system was originally informed by the miasmic theory (that illness was due to ‘bad air’), but subsequently adapted to the new germ theory which prevailed in the late 19th century.

The thinking behind the pavilion hospital gave rise to an aesthetic at CDC that was both pleasing and pragmatic, as the *Straits Times* noted in 1913:

- ‘the designs are graceful and consistent, with a suggestion of Old English conception about them. From Moulmein Road, the hospital presents a very pleasant pastoral picture to the eye’.
- The hospital’s layout expressed a ‘precautionary forethought that pervades the whole scheme of things’.

The Moulmein Road Hospital was built by contractors D.J. van Wijngaarden, Graham Hitchison and Woon Ah Fong. The architect was W. Campbell Oman, ARIBA engineer surveyor and chief architectural assistant to the municipality, who also supervised the construction. Construction was directed by R. Pierce, MICE, the municipal engineer.

Dr Edmund Monteiro (oral history, 1997) added on thinking behind the layout,

It was all right to put a patient with typhoid next to a patient with dysentery, next to a patient with diarrhoea or hepatitis because they couldn’t spread to one another through the air easily’. ‘So that’s why they had to have something like 12 wards in an area of this size. Mostly to keep these diseases apart from one another. So those were the days when technology was such that you put distance between different types of diseases.

However, increasingly the dispersed pavilion system became an anachronism in modern medicine. As Kisacky observed,

What did not suit the new medicine was the distance between pavilions, which complicated the increasingly requisite movement of patients and practitioners (doctors and nurses) between a variety of increasingly specialised spaces – labs, surgical facilities, specialisation or decontamination facilities, therapeutic facilities, diagnostic facilities, wards and administration.

This problem can be seen in the staff’s oral history recollections about having to traverse wide distances between the wards.

4.2 The naming system

The naming system of CDC’s buildings is interesting though somewhat confusing. As late as 2018, CDC had four naming systems from different time periods:

- Originally, there were simply three sections for smallpox, bubonic plague and cholera. It is not known when the wards were given names.
- By 1932, however, letters of the alphabet were used to name the wards, from A to O, as shown in the 1932 cadastral map of CDC (partially) and more completely in the 1951 table below.
- In 1971, roman numerals beginning with ‘1’ were used, as implemented by the Medical Superintendent of CDC, Dr Leong Kwok Wah.
- In 1985, roman numerals beginning from ‘71’ were used when MH merged with TTSH to become CDC, as TTSH’s ward numbers ended in the ‘60’s.
- From an unknown recent date, roman numerals beginning from ‘800’ were used.

The uses of MH’s 17 wards in 1951 were:

A, B, C, M, N, O, each of 2 beds for Isolation and Miscellaneous Cases (these were the observation and discharge wards for plague and cholera)	12 beds
L Diphtheria	26 beds
L1 Diphtheria	10 beds
L2 Diphtheria Convalescent	10 beds
D1 Enteric M (typhoid)	8 beds
D2 Enteric F (typhoid)	8 beds
F Measles etc	4 beds
J Dysenteries	18 beds
G Chickenpox	22 beds
E Dysenteries and Emergency Ward, at present polio	32 beds
K polio	32 beds
Total	176 beds
H Carriers, contacts etc rarely used	30 beds

Source: HD 113/45 Vol. 2 Middleton Hospital, Memo from W.E. Hutchinson D.H.O., 20 June 1951.

Particularly historic buildings of CDC include (a full historical account of the buildings is found in the History of Buildings & Wards document):

4.3 The Administration Block (Block 804, the ‘nerve centre’ of the hospital)

The Administration Block was built in 1913, located a hundred yards up the central driveway from the gate. It comprised the doctor’s office, laboratory, medical and household storerooms, and kitchen. In 1958, the City Council disapproved the construction of new

administration offices and stores to meet the large increase in staff from 72 in 1951 to 222 in 1953. Mayor Ong Eng Guan explained that this was due to a shortage of funds as City Council was in deficit. In 1967, a new Administration Block was built and was renovated and expanded in 1992.

Dr Edmund Monteiro (oral history, 1999) recalled that the administrative block housed the office of the Head of Department, Dr Wong Sin Yew. On the right was a small conference room. Behind that, there were two offices. This was historically the nerve centre of Middleton Hospital, where the matron, medical superintendent, pharmacy, and nursing staff were housed. There was a kitchen behind the block.

Prof Chew Suok Kai (email correspondence, 2019) recounted that the administration block consisted of 2 blocks. In 1992, the patient reception area, consultation room, and procedure room were renovated into the front block of the block. The front block housed the Medical Director, Personal Assistant, Hospital Secretary, two offices and a Conference Room. Next to the consultation room was a room for the PABX telephone system where a telephone operator took calls during office hours. The back block was renovated to house the general administration officer, medical records and computer systems.

4.4 The Original Smallpox, Plague and Cholera Sections

These three sections were built in 1913 and comprised the original wards of the hospital. They dealt with cases of the ‘Big 3’ notifiable infectious diseases at the time. In subsequent decades, the Smallpox Section was likely renamed and became Blocks 877-879. These wards were converted to new uses, such as chickenpox, poliomyelitis, dysentery, diarrhoea, and eventually dermatology cases.

The Plague Section likely became Blocks 873-875, and was used for chickenpox patients, including National Servicemen and migrant workers. The Cholera Section likely became Blocks 876, 876A and an unnamed ward north of Block 871. Dr Edmund Monteiro (oral history, 1999) referred to the unnamed ward as a ‘relic of the past’, having been a luxurious A Class ward for Europeans.

The Smallpox Section was unique among the three sections in having Class A and Class B wards for better class European and Asian patients. Due to reasons of economy, the Plague and Cholera Sections only had Class B and lower wards for lower class Asian patients. But European and upper class Asians were able to use the 6 small observation and discharge wards immediately to the south, each of which comprised 2 beds and was attended by two nurses and one health attendant.

The observation and discharge wards were used for isolation and miscellaneous cases after the Second World War. Dr Monteiro (oral history, 1999) referred to Block 803, one of the observation and discharge wards for cholera, as another ‘relic of the past’ when it was a Class A facility for Europeans.

4.5 Ward 76/E Ward/Block 876 (for poliomyelitis and AIDS)

Ward 76/ E Ward/Block 876 was likely part of the original Cholera Section. In 1950, the Director of Medical Services and the Municipal Commissioners agreed that post-infectious cases of poliomyelitis that required physiotherapy would be warded at MH. In 1951, a special post-poliomyelitis unit was developed at MH, hailed as ‘a very important and necessary venture’ due to the increase in cases. E Ward was thus staffed and equipped for this purpose, including the acquisition of four respirators. The ward had approximately 40 beds for the treatment of early and late cases of poliomyelitis.

During the 1958 poliomyelitis outbreak in Singapore, the chickenpox ward at MH was closed to admit poliomyelitis patients, and its dysentery cases were transferred to SGH to make room for poliomyelitis cases. MH’s post-infectious poliomyelitis patients were transferred to SGH and St Andrew’s Mission Hospital.

Dr Edmund Monteiro (video interview, 1999) recalled that Wards 76 and 76A were built in the 1920s. Ward 76 had about a dozen beds and was previously known as Ward E, an open ward for acute poliomyelitis in the 1950s, including poliomyelitis patients who had to use an iron lung respirator. This was a very busy part of the hospital in the 1950s until the 1960s, and there was a physiotherapist in attendance who would help the patients to exercise. An orthopaedic surgeon used to come and plan treatment for the patients, e.g. to shorten the limbs and change the treatment. This was the ‘heart of the hospital where poliomyelitis patients were managed’.

With the appearance of HIV-AIDS in Singapore in 1985, Ward 76 was converted for the care of AIDS patients in 1986. As MOH stated, ‘A ward at the CDC was ready in March to provide inpatient treatment for AIDS patients. It admitted its first patient in 8 Sept. CDC, Middle Road Hospital continued to provide outpatient care for AIDS patients and carriers’.

Dr Monteiro (oral history, 1997) said that Ward 76 was an open, nightingale ward. The first Singaporean with AIDS surfaced in 1985. MOH decided that AIDS patients who needed inpatient care would be warded in CDC. Ward 76 was converted into a 12-bed ward so patients would have privacy and a bathroom attached. He added, ‘Because we anticipated that a lot of these patients with AIDS, if they came in, would also die in hospital’. At the time of the interview, half of the beds were occupied. There were 2 types of patients: 1) Those who needed intravenous injections several times a day, 2) Those with advanced HIV, lived alone and couldn’t cope with the demands of daily living. Low Hong Siam (oral history, 2019), a CDC nurse, said that Ward 76 was selected for AIDS patients because it had single rooms.

Dr David Allen (email correspondence, 2019) remembered Ward 76 as a sad and desperate place. AIDS patients were often shunned by their families and society due to fear, shame, and uncertainty what to do and/or what to say. From a professional perspective, it was challenging for him working within the existing constraints.

Ms Ong Quek Neo (oral history, 2019) recalled that few relatives visited the AIDS patients. The last 4 rooms in Ward 76 were converted into open wards due to the lack of room.

However, nurse Ms Tan Ah Choo (newspaper interview, 1991) offered a different view:

Contrary to what people might think, Ward 76 is NOT a gloomy place... For one thing, it was renovated a few years ago, the wall colours are light and pleasant, and sunshine comes in from BOTH sides of the ward...Each patient has his own room in Ward 76, and spends most of this time there. Many like to read...Those who are not bed-ridden are encouraged by the nurses to take walks around the compound.

Sometimes a patient's relatives or friends may visit him...The relatives bring food and news about home, just like in any other hospital.

4.6 Ward 76A/L Ward/ Block 876A (for diphtheria and palliative care of AIDS patients)

Ward 76A/L Ward/ Block 876A was likely part of the original Cholera Section. In 1917, the hospital began to admit diphtheria patients from GH. In 1919, L Ward was completed at the Moulmein Road Hospital for diphtheria. Convalescent diphtheria cases from GH were admitted to MH. Diphtheria quickly became the most serious illness treated at MH in the 1920s and was made notifiable in 1941. In the 1937 cadastral map, L Ward is marked to the northeast of the Administration building. With the advent of HIV-AIDS in Singapore in 1985, Ward 76A was converted into a palliative ward for terminally ill AIDS patients.

According to Dr Edmund Monteiro (oral history, 1997, video interview, 1999), Ward 76A was a 30-bed ward previously used for diphtheria with a small operating theatre for tracheotomies. But as diphtheria had disappeared by the late 1960s due to compulsory immunisation and Ward 76 had only a dozen beds, Ward 76A was converted into another AIDS ward for terminally ill patients. It had B2 Class rooms and a day infusion clinic for AIDS patients. There was room for six people.

Monteiro related of the ward, 'Death is imminent within the next few days, few weeks'. Most patients opted to die in MH, not at their home, as their families could not cope with their dying at home. CDC had terminal care facilities e.g. grief counselling.

4.7 The Cubicle Ward (Ward 2/Ward 71/ Block 871)

This 30-bed cubicle ward with self-contained rooms, a glass partition and a modern architectural design was built in 1956. It was officially opened by Mr R. Middleton-Smith, Acting President of the City Council on 11 October 1956. It was originally intended to have 60 beds, but the budget was inadequate for fully furnishing them. The glass partition, the first of its kind in Singapore and Malaya, was historic as it gave nurses a view of patients in other rooms. Architecturally, the cubicle ward differed significantly from the early 20th century pavilion wards which dominated CDC. It became a busy part of MH when it was built.

Dr Ng See Yook provided insights on the need for a cubicle ward (HD 113/45 Vol. 1 Middleton Hospital, 1950):

the building of cubicle blocks will greatly facilitate the treatment of several infectious

diseases simultaneously and also the nursing staff requirement will be reduced. Opinion holds that in a modern hospital 50% of the beds should be in cubicles. A cubicle block is also necessary for cases of doubtful diagnosis, or of double infection and also for those diseases of which few cases are admitted. The present hospital built on a pavilion system where the percentage of patients sent in which a diagnosis subsequently found to be erroneous is high, the need of a cubicle block becomes essential to supplement the present 200 beds accommodation.

Dr Edmund Monteiro (oral history, 1997): The Cubicle Ward was an acute ward. When measles was a major health problem in the past, half of the patients in the ward were children with measles. Presently, it treated patients with chickenpox, dengue and occasionally enteric fever. The Cubicle Ward was the busiest part of CDC, catering mostly to foreign workers of C Class, admitted for chickenpox, dengue, and diarrhoeal diseases.

Dr Chew Suok Kai (email correspondence, 2019): the Cubicle Ward was a C Class single ward for diseases of public health importance, e.g. cholera, typhoid, malaria, and chickenpox. Sometimes, patients with same disease would be treated in the same single cubicle when occupancy was high.

Dr David Allen (email correspondence, 2019): There was a functional Iron Lung respirator from the poliomyelitis era in the back storage area of this ward. We were to keep it until the last technician capable of repairing it retired. The contingent of Gurkha guards assigned to Lee Kuan Yew were warded there with cholera. It was impressive to see these fearless warriors laid low by diarrhoea.

4.8 Ward 1/Ward 72 (the paying ward)

In 1971, as part of the government's hospital modernisation programme, the first air-conditioned ward in MH was announced in response to people's rising expectations for healthcare. With a modern architectural design, the ward would accommodate 28-30 first- and second-class patients. Previously, MH was a free hospital with no air-conditioned wards. At different times, it was used for dermatological patients, triaging for probable cases during the SARS outbreak, suspected cases in the 2015 MERS-CoV outbreak, and for respiratory isolation of tuberculosis patients.

Dr Edmund Monteiro (oral history, 1997, video interview, 1999) related that the ward was built in 1971 on a site where a Class A ward (likely an observation and discharge one) and another ward had previously stood, which were demolished to make way for the ward. Ward 72 had 22 beds, with single rooms with an attached bathroom for each patient. It offered A Class and B1 Class accommodation, with air-conditioned and non-air conditioned single rooms respectively. The Class A rooms also had a telephone and TV. B1 rooms did not have these amenities but the food served was similar. The ward was initially meant for patients with infectious diseases, but the hospital could never fill the beds. Thus patients with dermatological conditions, if they wished, could move from B2 (four patients to a room) to B1 or A1 on a case-by-case, first-come-first-served basis. Previously, MH was 'classless'

with C Class beds.

Prof Chew Suok Kai (email correspondence, 2019) stated that the ward contained A and B1 Class beds which took in patients with all sorts of infectious diseases of public health importance. The first doctor with AIDS was treated in this ward. There was a small room in Ward 72 where a laboratory technician handled blood specimens for simple tests like haemoglobin, ESR, hanging drop test for cholera, slides for malaria parasites, etc. More sophisticated tests were carried out at the main laboratory in TTSH.

Dr David Allen (email correspondence, 2019) recounted that the ward reminded him of the inexpensive court motels found along the back highways in the US during my youth. It was clean, functional and cosy. The call room had a great air-conditioner, making this a preferred site for tea breaks and impromptu teaching for the staff.

5 Physicians, nurses and other staff played key roles in infectious disease management.

5.1 Medical Superintendents and Directors

Table 3. List of medical superintendents and directors of Middleton Hospital and CDC

Period	Office-Holder	Notes
Moulmein Road Hospital		
1913-1914	Dr W. Mayne Hitchins	Dr Hitchins assumed duties as Medical Superintendent and 2 nd Assistant Health Officer of the Singapore Municipality on 8 February. The Municipal Commissioners subsequently decided that the post of Medical Superintendent should not be combined with that of Assistant Health Officer.
1914-1915	Dr A.F. Legge	Dr Legge assumed duties as Medical Superintendent in May to relieve Dr Hitchins. But Legge was mobilised for military duty in the Medical Company of the Volunteers when World War I broke out. He died on 16 February 1915 from wounds sustained in operations against the sepoy mutineers of the 5 th Light Infantry. Dr Hitchins was therefore in charge for practically the whole year.
1915-1916	Dr W. Mayne Hitchins	
1916-1920	Dr E.W. de Cruz	Dr W. Mayne Hitchins resigned on 8 February 1916 but owing to the enlistment of medical men for the war, no attempt was made to fill the vacancy permanently. Instead, a local officer with an Assistant Surgeon's qualification was appointed temporarily as Superintendent. The government appointed Dr E.W. de Cruz as Acting Medical Superintendent. He was among the first L.M.S graduates in Singapore. His work was supervised by the Health Officers.
Middleton Hospital		

1920-1925	Dr W. Dawson	<p>Dr Dawson arrived from England in May 1920 and assumed duties as Medical Superintendent/Resident of MH and Tuberculosis Officer. Dr E.W. de Cruz returned to Government service in June 1920 and was transferred to TTSH, where he worked for about 16 years. In 1924, Dr Dawson went on long leave from 22 March until November. Dr G.A.C. Gordon was the Acting Medical Superintendent in this period.</p> <p>It is unclear if Dr Dawson was the Superintendent in 1925; Dr A. Thurai appeared to have been Acting Medical Superintendent that year.</p>
1926-1942	Dr Colin C.B. Gilmour	<p>Dr Gilmour went on leave in December 1925 and returned in October 1926. Dr Thurai was in temporary charge of MH in his absence. Dr Gilmour resumed his position on 5 December 1926.</p> <p>Dr Gilmour went on leave again in December 1930 and returned in August 1931. Dr A. Thurai was Acting Medical Superintendent in his absence.</p> <p>Dr Gilmour went on leave in November 1934 and returned in April 1935. Dr A. Thurai again took charge in his absence.</p> <p>Dr Gilmour went on leave on 26 October 1938 and returned in July 1939. Dr A. Thurai was Acting Medical Superintendent in this period.</p>
Densen Byoin		
1942-1945	Dr Ernest Steven Monteiro	<p>Dr E.S. Monteiro was the Medical Superintendent during the Japanese Occupation, when the hospital was known as Densen Byoin. In June 1944, he gave a talk on dysentery at the Syonan Tokubetu-si Auditorium, while Dr Ng See Yook gave a talk on microscopic specimens.</p> <p>In 1947, Dr Monteiro was among 146 Singaporeans who were presented with Certificates of Commendation for their services during the Malayan campaign, Japanese Occupation and British Military Administration.</p>
Middleton Hospital		
1946	Dr Balhatchet	<p>In June 1946, as Dr Monteiro's services were required at the College of Medicine, the Medical Superintendent of TTSH, Dr Balhatchet, was to assume the duties of the Medical Superintendent of MH in addition to his own.</p>
1946-1948	Dr H.R. Morrison	<p>As Dr Balhatchet could not devote enough time to MH's affairs, on 1 October 1946, Dr Morrison was appointed Medical Superintendent of MH.</p>
1949-1957	Dr Ng See Yook	<p>Dr Ng went on long leave in the UK on 8 September 1950 and Dr Morrison was appointed the Acting Medical Superintendent until he returned in August 1951.</p>
1958-1979	Dr Leong Kwok Wah	<p>Initially, Dr Leong was the Acting Medical Superintendent. In 1960, he was assisted by other City Council doctors, who did calls on a roster. Assistance was also given by consultants</p>

		from SGH, Professors Ransome and E.S. Monteiro, and Orthopaedic Surgeons, Professor Karlen and Mr Friedman. In 1961, Dr Leong took up a departmental fellowship at the University of Malaya to study for the Diploma in Public Health. Dr K. Karunakaran, the Assistant City Bacteriologist, was Acting Medical Superintendent from 28 April 1961 to 5 March 1962. Dr Leong resumed his duties on 5 March 1962 after completing his studies. His appointment was confirmed on 30 May 1964.
Communicable Disease Centre		
1980-1992	Dr Edmund H.A. Monteiro	Dr E. Monteiro was the Medical Director.
1992-1993	Dr Edmund H.A. Monteiro	Dr E. Monteiro was the Medical Director.
1993-1995	Dr Chew Suok Kai	Dr Chew was the Medical Director.
1995-1998	Dr Wong Sin Yew	Dr Wong was the Clinical Director.
1999-2018	Dr Leo Yee Sin	Prof Leo was the Clinical Director. There was a one-year lapse between 2002 and 2003. With the onset of SARS in Singapore in March 2003, Prof Leo was re-appointed the Clinical Director.
National Centre for Infectious Disease		
2017-	Prof Leo Yee Sin	Prof Leo is the Executive Director of NCID, appointed in July 2017 with a one-year overlap period between CDC and NCID.

5.2 Matrons, Chief Nursing Officers and Nursing Directors

Table 4. List of matrons and nursing directors of Middleton Hospital and CDC

Period	Office-Holder	Notes
Moulmein Road Hospital		
1913-1920	Mrs A.L. Toft	Mrs Toft went on long leave in June 1920. Three municipal nurses resident at MH took turns to be the Acting Matron. She returned from leave in May 1921 and resumed duties as Matron.
Middleton Hospital		
1920-1925	Mrs A.L. Toft	Mrs Toft went on leave for eight months from 3 July 1925.
1925-1937	Miss W. McMurray	Miss McMurray was appointed Matron in April 1925. Mrs Toft retired in March 1926. Miss McMurray went on leave in April 1935 and returned in November 1935. Mrs Auten acted as Matron in her absence.
1938-1941	Mrs R.A. Auten	Miss McMurray retired in June/July 1938. Mrs R.A. Auten was appointed to succeed her as Matron. She probably left in 1941 as there was a job advertisement for the position on 28 April 1941, in the <i>Malay Tribune</i> .
1942-1945	Mrs Lang Jun Hua	
1947	Miss M.K. Cox	

1948-1950	Sister Fraser	
1950-1957	Sister L. Miriam Powell	Sister Powell had served as Acting Matron when Sister Fraser went on long leave in the UK at the end of November 1950.
1957-1969	Mrs Louise Wong / Madam Louise Chew	Mrs Louise Wong, Senior Sister, was appointed Matron in April 1957. She had joined Middleton Hospital in 1952 and was also known as Madam Louise Chew.
1970-1985	Ms Lucy Seah	
Communicable Disease Centre, TTS defence		
1985-1988	Ms Margaret Wan	
1988-1993	Ms Teh Ai Choo	
1994	Ms Dorothy Ong	
1995-1998	Ms Theresa Straugan	
1998-2006	Mr Harbhajan Singh	
2006-2018	Ms Quek Lee Kheng	
National Centre for Infectious Diseases, TTS defence		
2018-	Dr Margaret Soon	

5.3 Heads of Department of Infectious Diseases

Table 5. List of heads of the department of infectious diseases in TTS defence, formed in 1992.

Period	Office-Holder	Notes
Communicable Disease Centre, TTS defence		
1992-1994	Dr David Michael Allen	
1995-1998	Dr Wong Sin Yew	
1999-2003	Dr Nicholas Iain Paton	
2003-2012	Dr Leo Yee Sin	
2012-2016	Dr Lim Poh Lian	
2016-2018	Dr Hsu Li Yang	
National Centre for Infectious Disease		
2018-2019	Dr Hsu Li Yang	
2019-	Dr Monica Chan	

5.4 Insightful stories of CDC and the staff

Our oral history research uncovered interesting and compelling stories of CDC. Far from being trivial or mundane, these anecdotes offer useful insights into wider themes in medical history, such as the crises, challenges and creative responses in infectious disease management, and the important roles and contributions of CDC staff. The stories add nuance and colour to the main historical narrative.

We uncovered recollections of Dr Leong Kwok Wah, the long-serving Medical Superintendent of MH between 1958 and 1979, of whom little is known in the published record. His colleague and successor Medical Superintendent, Dr Edmund Monteiro (oral

history, 2018), remembered Dr Leong as pragmatic, calm and organised. Dr Leong was a public health-trained doctor who went into clinical work. He invited Dr Monteiro to have lunch with him on the day of Singapore's independence.

Nurse Ms June Leng (oral history, 2019) remembered preparing pots of stools of typhoid patients for Dr Leong to examine in the 1970s.

A more personal reminiscence of Dr Leong came from his daughter, Ms Linda Leong (oral history, 2019). She recalled how her parents often talked about diseases over meals, such as diarrhoea and counting worms in the stools. Dr Leong went to Calcutta to attend WHO meetings on infectious diseases. He alternated his work with Dr Monteiro and was on call at night frequently. Dr Leong received a Public Service (Silver) medal for his work at MH. Ms Leong also noted that her father saved many people's lives, including a grateful Indonesian lady with poliomyelitis whom her father treated by cutting a hole in her windpipe.

In contrast, Dr Monteiro's colleagues and staff had much more to say about him as a medical superintendent and physician. Prof Leo Yee Sin (oral history, 2019) assessed Dr Monteiro to be a dedicated doctor, belonging to the generation of doctors for whom the hospital was their home; he was always on call and knew the patients well.

Young nurses Ms June Leng and Ms Joyce Arokisamy (oral history, 2019), who worked with Dr Monteiro in the 1970s, found him initially intimidating as he was strict. But they subsequently learned his methods and were able to work with him. They realised that he cared about his patients and was responsive to calls.

Their colleague from the period, Ms Meeravathy PS (oral history, 2019), lauded Dr Monteiro for being supportive of his nurses: 'You can't get a good doctor like him'. Dr Monteiro would 'clerk' the patient, finding out their personal backgrounds.

Nurse Ms Vinotha Malar (oral history, 2019) noted that Dr Monteiro was 'really devoted' to his work and would attend to cases in the middle of the night.

CDC's telephone operator Mr George Yeo Poh Kee (oral history, 2019) recalled Dr Monteiro as 'a very nice man', 'very open to us' and very humble.

Nurse Ms Ong Quek Neo (oral history, 2019) said that Dr Monteiro 'really gave his life to AIDS. He was on call for AIDS patients at any time.'

Nurse Ms Han Kwee Yin (oral history, 2019) agreed that Dr Monteiro was very committed to the AIDS patients. He also drove tuberculosis patients in his car to the Tuberculosis Control Unit nearby for X-ray screening if an ambulance was not immediately available.

In her time at CDC, Prof Leo Yee Sin (oral history, 2019) learned much about her role as a physician, especially how medicine was not just about medication, but also involved the

holistic management of individuals. She learned much from the Nipah, SARS and dengue outbreaks beyond her academic education. Her practical experience at CDC was fast-paced. During the dengue outbreaks in 2004 and 2005, she was surprised to learn that there was little existing research and data on dengue. She learned how to organise evidence-based management and monitor dengue patients during the acute period at CDC.

Ms Ong Quek Neo (oral history, 2019) remembered that Prof Leo listened to her views and always tried to find a way to help.

Ms Nurse Dorothy Gomez (oral history, 2019) lauded Prof Leo as a ‘great leader’, always calm in the face of difficulties.

The oral histories also showed that the nurses and other staff of CDC played vital, oft-unheralded complementary roles to the doctors.

Prof Leo Yee Sin (oral history, 2019) complimented her nurses as ‘a very courageous bunch of people’. CDC was not a glamorous hospital and some nurses had to convince their family to allow them to work there, as they would be in proximity to dangerous diseases. Yet even during the SARS crisis, CDC had no HR issue: all the nurses stepped up to the challenge and no one resigned. A pregnant staff nurse even appeared on TV to help destigmatise SARS.

Nurse Ms Cheong Yoke Lin (oral history, 2019) had to act quickly to cope with the lack of facilities in CDC. There was a Japanese traveller admitted to Ward 71 with typhoid. When he developed melaena and his blood pressure plunged, she directed her nurses to put him on a drip and call the blood bank to reserve blood for him, before an ambulance from TTSH could arrive about 10 minutes later. On the need for quick thinking, she remarked, ‘You were in an isolated area where you don’t have all the facilities’. Although Ms Cheong felt sad about its closing down, she acknowledged that CDC lacked facilities: ‘The emergency things are not there...when you need it, you have to really run for it’.

Ms Dorothy Gomez (oral history, 2019) lauded how the nursing team for AIDS in Ward 76 was ‘very strong and committed’, such as Ms Ong Quek Neo. She also praised Mr Harbhajan Singh as a ‘great leader’ during the SARS outbreak, who was experienced, calm and able to give clear directions to his nurses. During the SARS outbreak, she volunteered to take aspiration phlegm samples from patients in a negative pressure room, as the nurses under her charge were single ladies whom she did not want to put at risk. One of the Filipina nurses insisted on accompanying her in the work.

Ms Akhterun Nisha (oral history, 2019) narrated some interesting experiences and challenges of working at CDC. For her, the SARS outbreak was ‘the most difficult to handle’ because some patients did not want to come to CDC, questioning if it was really a hospital because it appeared rundown; some of them demanded, ‘What place is this?’, preferring to be treated at TTSH instead.

Ms Nisha recalled that due to their emotional state, some AIDS patients became ‘naughty’ or even violent, threatening to cut their arms and splash their blood on the nurses, or picking fights with them. Other AIDS survivors had, however, become her best friends.

Ms Nisha also related how a parapet was erected in a ward to separate chickenpox and dengue cases, and how Bangladeshi migrant workers who had chickenpox bathed with the neem leaf which reduced the itch.

Ms Low Hong Siam (oral history, 2019) told the story of a patient who was afraid to sleep alone in his room. He was an SIA staffer who was in the paying ward (Ward 76). She had to keep him company, and he later told her that he saw an apparition in his room. They brought in a priest to bless the ward.

Another major research finding was that many veteran nurses attributed their formative experiences in caring for patients to working in CDC. They underlined particularly the importance of compassion and holistic care.

Ms Meeravathy PS (oral history, 2019) related that Dr Monteiro taught her the importance of the holistic care of patients: that treatment should not just be medical but also psychological. She found that language was not necessary for the holistic care of patients.

Ms Joyce Arokiasamy (oral history, 2019) said that it was gratifying to see patients get better when nurses built relationships with them. She looked after some patients for months, so it was important to treat them like family. Perhaps for this reason, she surmised nursing to be a profession which ‘grew on you’: its meaning came out of the work she did and her positive experiences in nursing.

Ms Han Kwee Yin (oral history, 2019) felt that it was important for nurses to show compassion to patients, to ask them about their health and sleep. This often changed patients’ behaviour and attitude for the better.

Ms Dorothy Gomez (oral history, 2019) believed that while it was vital to maintain high standards of infectious control procedures, it was also necessary to bond with the patients by being receptive towards them and taking the time to talk to them. She understood that not only the patients, but also their families might endure a difficult time. Being a nurse for AIDS patients made her learn ‘what compassion was all about’.

Likewise Ms Cheong Yoke Lin (oral history, 2019) had to be patient with AIDS patients, because they may have a feeling that ‘Why should I have HIV?’, and they might otherwise become aggressive or throw tantrums.

Ms Ong Quek Neo (oral history, 2019) became close to the sisters of a AIDS patient who was an SIA pilot. Some patients’ relatives visited her in hospital when she became ill and was warded in hospital. Her colleague Ms Mary Stevens told her that the human touch was the

most therapeutic act for a HIV patient. Stevens also provided patients from low-income backgrounds rations and helped them find employment, which improved their quality of life and morale.

Ms Akhterun Nisha (oral history, 2019) underlined the need to understand patients' likes and dislikes, which are things not taught in nursing school. She was able to advise doctors about individual patients, because a good, empathetic nurse is able to learn things about patients which they will not tell the doctors, e.g. their social background and need for social assistance. A lot of nursing work was advocacy work. Some of her patients had come by to thank her and other nurses when they returned to CDC for appointments, bringing cakes, fruits and chocolate. Some patients told her that they would prefer to die with a CDC nurse.

Our research traced major changes and developments in nursing in Singapore since the 1960s. Some of the older nurses we interviewed felt that nursing was more rewarding in the past. While such views may be partly due to nostalgia, it is also important to examine the reasons the nurses gave for them.

Ms June Leng (oral history, 2019) felt that there was much more satisfaction working as a nurse in the early days (in the 1970s), when patients showed more appreciation and some patients became her friends. She perceived that nurses today have a different attitude and spend less time cleaning the wards. She felt that it is difficult to pass on these old values to the younger nurses.

Ms Meeravathy PS (oral history, 2019) discussed the present nursing syllabus in the polytechnics, in which nurses' main job is to prescribe medication and carry out injections. Their work has also become computer-oriented (as is the case with doctors). Ms Meeravathy and Ms Joyce Arokiasamy (oral history, 2019) highlighted their pride working in starched nurses' uniforms and wearing the stiff nurse caps.

Our oral histories also traced major socio-economic changes in the nursing profession since the 1970s. Mr Harbhajan Singh (oral history, 2019) laughed that his first pay was \$152.50 a month and working hours were longer then. He said that there are many foreign nurses today and the local complement of nurses also includes permanent residents, so the number of local-born nurses is relatively small.

There are clearly better opportunities and salaries for nurses today. Ms Han Kwee Yin (oral history, 2019) noted that there are more training opportunities for nurses, including the opportunity to attend overseas conferences.

Ms Low Hong Siam (oral history, 2019) believed that the work of nursing is easier these days. In the past, a nurse and an assistant nurse ran a ward with about 40 patients, while nurses today may have volunteers to help them and are not able to perform certain tasks. The culture of work has changed, but this may be for the better. In her time, senior nurses could be strict and demanding, 'We were just thrown to do the work...We don't dare to

answer...we only cry to ourselves...when scolded by the nurses'. She was scolded for not collecting urine samples from diabetic patients. Nevertheless, although nursing is hard work, she did not regret her decision to join the profession, which she found to be meaningful.

Other reminiscences dwelt on significant technological changes in nursing. Ms Joyce Arokiasamy (oral history, 2019) recalled the use of carbolic soap at MH for washing to be a memorable ritual, and that there were no disposables for use in her time, so they had to clean syringes and other equipment and clothing to be reused. She also remembered having to find creative ways to create suction for tubes. Ms Meeravathy PS (oral history, 2019) agreed that there were no disposable masks (they used linen masks), gowns and gloves in the 1970s, and many items had to be prepared manually.

Matron Louise Chew (*100 Years*, 2007) recalled that 'The ward floor would be kept wet all the time by sprinkling carbolic lotion' in the 1950s and 1960s. She elaborated on 'a colonial practice': 'Staff that had direct contact with any patients were not allowed to leave the hospital in their white 'indoor' uniforms. They must have a bath and change to their blue "outdoor" uniforms including their footwear before leaving the premises'.

Ms Quek Lee Kheng and Mr Harbhajan Singh (*100 Years*, 2007) related on the need for technological innovation,

One of the biggest challenges that nurses had to face was coping with patients with cholera. They often presented with bouts of copious diarrhoea. This would invariably increase the demand for frequent changes for bed sheets. Creative and innovative ideas were put to tests and the nursing team saw the first prototype (and eventual production) of a cholera bunk bed.

6 CDC worked closely with other government agencies and non-governmental organisations.

CDC was a small hospital and facility that was part of a larger healthcare system. CDC was administered at various times by the Municipal Commission (1913-1942, 1945-1950), the Japanese administration (1942-1945), the City Council (1951-1960), MOH (1960-1995), and TTSH (1995-2018). CDC worked with a number of hospitals and facilities throughout its history, including TTSH, Middle Road Hospital and the National Skin Centre. In 1963, when there was a rare cholera outbreak in Singapore, MOH reported, 'The role of the hospitals, more particularly, the Middleton Hospital, was secondary to the work of the Public Health Division' in preventing the spread of the disease.

Epidemiology was a major part of infectious disease control in Singapore. In 1962, an Epidemiological Section was created to form a new Epidemiological and Quarantine Service under the Environmental Health Services of MOH. The role of the section, MOH explained, was to 'keep up-to-date epidemiological information with regard to all notifiable infectious diseases'. It added, 'It is hoped that in 1962, the question of infectious disease control which logically should be under this section will be looked into and a more uniform system be

brought into action, co-ordinating Middleton Hospital, the School Health and Maternal and Child Health Services and the Epidemiological Section'.

From 1972, epidemiological work came under the purview of Ministry of the Environment, a new ministry set up in September that year to assume from MOH and the Ministry of National Development the work of environmental health and pollution control. The ministry's Quarantine & Epidemiology Department was made responsible for epidemiological investigation into and control of communicable diseases. This work represented collaboration between public health, epidemiology and environmental engineering. MH thus worked in close coordination with Environment in the screening and investigation of infectious diseases.

An important source on the role of Environment in infectious disease control is Prof Goh Kee Tai's *Epidemiological Surveillance of Communicable Diseases in Singapore*, published in 1983. It placed CDC's role as a treatment, isolation and quarantine facility in context by mapping the national framework for the epidemiological surveillance of communicable diseases. Prof Goh was the Head of the Quarantine & Epidemiology Department and the Secretary of the Joint Coordinating Committee on Epidemic Diseases.

In particular, the book highlighted the important cross-agency role of the Joint Coordinating Committee on Epidemic Diseases, formed in 1973 with representatives from various ministries and agencies involved in epidemiological work, namely, MOH, Environment, the National University of Singapore, Ministry of Defence, and Primary Production Division. The Joint Committee was responsible for the coordination, formulation and evaluation of communicable diseases control in Singapore. Its tasks were to:

- 1) coordinate the work and responsibilities of the Health and Environment ministries on diseases of public health importance.
- 2) initiate surveys and research on diseases of public health importance for the purpose of obtaining information on which future policies and activities to maintain the health of the community may be planned.
- 3) to present information on diseases of public health importance to the government and the public.

As Prof Goh's book related, the work of Environment and the Joint Committee was instrumental in replacing the outdated practice of communicable diseases control in Singapore through quarantine with epidemiological surveillance in the community. The book detailed the outbreaks and control of infectious diseases in the 1970s and early 1980s, such as the sexually-transmitted diseases, enteric fevers, diarrhoeal diseases, tuberculosis, and leprosy. This account synthesised the information periodically reported in *Epidemiological News Bulletin*, published by the Joint Committee and which is a useful resource on the history of infectious disease management in Singapore.

The book thus places MH's role within a larger epidemiological system for the screening, treatment and isolation of infectious disease cases and select groups of people, such as food

handlers. In 1975, the Joint Committee decided that all typhoid cases diagnosed in Singapore would be treated at MH. That year, there was a typhoid outbreak in Jurong and the committee stipulated that all food handlers and their assistants in Taman Jurong Food Centre would be screened at MH, especially those selling ‘high risk’ food, who would be screened daily for five consecutive days and suspended from operating their stalls until they were medically certified free from typhoid. In 1980, MH was similarly involved in another typhoid outbreak at the Satay Club and Esplanade Food Centre.

Dr Edmund Monteiro (oral history, 1997, 2015, 2018) elaborated on MH’s relationship with the Ministry of the Environment. This arrangement was uncommon elsewhere outside of Singapore: ‘Now a lot of people who come to Singapore are very puzzled for the first time. How come the Ministry of Environment is involved in notification?’. When a case of infectious disease was confirmed, Environment would be notified. Prof Goh was the ‘comms person’ at Environment. Monteiro noted that this close relationship between doctors and Environment worked well for Singapore in detecting and controlling infectious diseases.

Dr Monteiro stressed that it was the ‘right decision’ to give greater emphasis to preventive medicine by creating a separate ministry. It underlined Prime Minister Lee Kuan Yew’s belief in the ability of engineers to transform Singapore. Much of the work in infectious disease control was thus done outside of CDC, e.g. in prevention and vaccination efforts which led to the disappearance of diseases such as diphtheria, poliomyelitis and smallpox. The success of CDC should not be separated from the progress of Singapore and the progressive mindset of its leaders. CDC functioned as a ‘necessary evil’ in the control of infectious diseases, though it lacked adequate medical care facilities.

A/Prof Ooi Peng Lim (oral history, 2019), a public health physician and official, provided further insights into the public health side of the SARS outbreak. The outbreak had the ‘worst timing’ as the public health portfolio was being migrated from Environment to MOH, as it made sense to have an integrated public health unit in MOH. He headed the public health investigation team at Environment, which worked closely with WHO, international organisations and the US CDC to contain the outbreak. SARS was particularly difficult as it required the home quarantine of contacts for the first time in Singapore history since smallpox; this was ‘a desperate measure for a desperate time’.

His team was experienced in contact tracing and was able to obtain honest responses from people. This was not easy as some market stall holders had hired illegal foreign workers. Although the team had recourse to legal action under the Infectious Disease Act, they also relied on gentle suasion. The contact work was challenging and required tact. The government stressed that SARS control had to be a national effort. A patient who broke quarantine was punished as a deterrent. An electronic picture camera, attached to phones, was used to verify the person’s location. The team focussed on the possible spread of SARS in public places such as hawker centres and places of worship.

A/Prof Ooi observed that one of the lessons of SARS was that it hit Singapore badly because

of the lack of operational staff with experience on the ground. This showed the pros and cons of outsourcing operational work. Subsequently, an operational group was formed to deal with future outbreaks. He also noted that while other hospitals were able to treat endemic and well-known diseases, CDC still has a role for diseases which are not well-understood, such as monkeypox. Singapore is a sophisticated case where clinicians and public health professionals need to work together. CDC has closed down, but the spirit of CDC remains in NCID, which is timely in light of emerging infectious diseases around the world.

In some instances, our research found that CDC's role as a quarantine and isolation centre was a disadvantage for infectious disease management. As Prof Leo Yee Sin (oral history, 2019) related, prior to the 1999 Nipah outbreak, CDC had become rather isolated from other hospitals, while disease control was still dispersed across the Health and Environment ministries. This was also a challenging time for CDC as its Clinical Director Dr Wong Sin Yew was leaving for the private sector without a successor designated.

In 1999, when the Nipah outbreak in Malaysia spread to Singapore, Leo was asked to organise the response to the outbreak. She was assisted by nurse Ms Ong Quek Neo. A major inter-agency massive screening campaign was carried out by three organisations across three ministries: CDC (as part of MOH), Quarantine and Epidemiology Department (Environment) and Primary Production Department (Ministry of National Development). 635 abattoir workers were screened at CDC in two weeks, of whom 36 were admitted for clinical observation and 3 of them subsequently found to be infected.

Prof Leo (*100 Years*, 2007) reflected that to many infectious disease physicians of her generation, the Nipah outbreak presented a brand new horizon in the field of infectious diseases now widely known as 'Emerging Infectious Diseases'. She learned several lessons: to expect the unexpected; that infectious agents in a time of globalisation respected no border; and that the level of preparedness determined the ability of an organisation to respond in a timely manner. CDC was an old facility, its infrastructure could not support the care needed for critically ill patients and its isolation facilities were obsolescent. It was fortunate that the Nipah virus resulted in no human-to-human transmission at that time.

Prof Leo added that another issue in the Nipah outbreak was infection control. In the overcrowded CDC outpatient clinic, packed with hundreds of exposed contacts, the staff wore full personal protective equipment (an N95 mask and a sleeveless plastic apron), but not the potentially infected exposed workers and potentially exposed uninfected workers. This taught a valuable lesson that proved to be enormously useful when combating SARS. In addition, the triage system designed to separate patients into risk categories at the first point of contact with healthcare was critical to prevent cross-transmission. CDC in Singapore was the first institution to introduce this system during the SARS outbreak, which was subsequently widely adopted in many parts of the world.

The Nipah outbreak, Prof Leo surmised, turned out to be 'a blessing in disguise', as it helped to prepare their mindset and response for SARS; Nipah was a 'small test' and an 'appetiser'

for SARS. She learned that infectious disease control could not be a ‘silo activity’ and to streamline the workflow at CDC during the outbreak. For example, infectious diseases often affected multiple organs which required the intervention of different specialists. But although Nipah affected the lungs and brain, some lung and brain physicians were unwilling to be involved, pointing to CDC’s role as the primary isolation centre.

Our research also found evidence of CDC working informally with NGOs. One example was Action for AIDS (AfA). Prof Chew Suok Kai (oral history, 2018), Dr David Allen (oral history, 2018) and Prof Roy Chan (oral history, 2019) related how CDC and AfA worked informally to reach out to marginal communities, such as to persuade sex workers and their clients to go for HIV testing, and to distribute condoms. This helped fill gaps in the government’s response to AIDS.

Some of CDC’s staff, such as Ms Ong Quek Neo and Ms Iris Verghese, also volunteered as nurses and counsellors with AfA in their personal capacity. CDC and Dr Edmund Monteiro in particular supported such voluntarism. Prof Chan called the volunteers the ‘lifeblood’ of AfA, who were key to its work and advocacy.

Prof Chew Suok Kai (email correspondence, 2018) noted that CDC also worked closely with other NGOs and medical associations and societies, such as the Singapore Anti-Tuberculosis Association and the Society of Infectious Diseases Singapore, which sought to educate the public and doctors on important infectious diseases.

7 CDC is a theatre of memory.

At the time of its closing in 2018, while the pavilion wards were still intact, part of the tangible heritage of CDC as an infectious disease facility had been lost. Some items of historical value have been kept with the TTSH Heritage Museum, such as the cholera bed and Black Lion municipal crest of CDC. But other items had been lost, including,

- The striking guardhouse façade, with the words ‘Middleton Hospital’ and the black lion crest, was demolished in 1983 for the widening of Moulmein Road.
- The historic negative pressure respirators, commonly known as ‘iron lungs’, which were used for poliomyelitis patients after the war. Prof Chew Suok Kai (oral history, 2018) has lamented the loss of the iron lung machines.
- The small bathing pool donated to MH by parents of a child who had poliomyelitis in 1951, which is pictured in a NAS photograph.

However, our project maintains that the heritage of CDC is not vested simply in its physical buildings or design, but also in the rich intangible cultural heritage, expressed in the memories of the doctors, nurses and other hospital staff, and patients. It is these memories which give deeper meaning to the buildings of CDC. This heritage also includes the reminiscences of patients of CDC and their loved ones, which are likely to be more nuanced or even ambivalent. While surviving patients and their loved ones may have positive

recollections, this is unlikely to be true of the families and friends of patients who passed away there, such as the early AIDS patients and patients of terminal diseases in the early history of CDC.

CDC is a theatre of memory. Fittingly, historian Raphael Samuel used this term for historical places which are imbued with deep social memories. These ‘theatres’ are meaningful to their users and the community despite the passage of time and even removal of the physical site. As a theatre of memory, CDC contains both positive and negative memories of illness, death, work, and social life. Some of these memories have been discussed elsewhere in this report. Here, we outline memories of the close relationships among the staff, making CDC into a family, and the more nuanced memories of patients.

7.1 CDC was akin to a family

The experiences of working in a small, pavilion-style hospital under a committed leadership and dealing with infectious disease threats forged a strong sense of community among the hospital staff. As our interviews reveal, part of the community owed to the unique rustic natural environment and the relatively slow pace of work at CDC.

As the former Matron Louise Chew (*100 Years*, 2007) related on her fondest memories of MH:

Top on my list would be working with people who are extremely dedicated. Under the charge of Dr Leong Kwok Wah and Dr E.M. Monteiro, we all had a very happy and peaceful time working together as a team, always respecting each other. Tasks were carried out willingly and efficiently...No one had ever refused to be posted to any area of work assigned to him or her. The esprit de corps was really great.

Ms Vinotha Malar (oral history, 2019), a nurse at MH in the 1970s, likened it to being a ‘kampong style’ hospital, filled with musang cats, snakes, durian, cashew, and tamarind trees. Her colleague Sister Yap carried an umbrella when she traversed the grounds in case a snake fell on her head. Ms Malar once had a fright when she saw a snake near the Bunsen burner on which she was doing a urine test. She found night duty ‘a bit frightening’ because MH was quiet and isolated and the lighting was dim. There were many stories of ghosts in the hospital.

Ms June Leng (oral history, 2019) remembered doing a lot of walking across the grounds of MH in the 1970s. It was rather scary to do night duty and she carried a rosary with her.

Ms Ong Quek Neo (oral history, 2019), who worked in CDC in the 1980s, recalled that the small road running through the hospital was full of potholes, making it difficult to push a body on a trolley to the mortuary. Snakes would sometimes drop from the trees after a rain, so some of the staff carried umbrellas over their heads for protection, especially at night. Work was slow-paced, and CDC was a place of ‘*lao mi si*’ (‘old nurses’).

Ms Cheong Yoke Lin (oral history, 2019) concurred that some nurses were afraid to do their night rounds and carried umbrellas because small snakes were known to have fallen from the

trees.

Ms Han Kwee Yin (oral history, 2019) recalled that CDC was ‘very quiet’, ‘very slow’, and ‘very open’ in the 1990s, with lime trees opposite Ward 78 in the northwest of the compound. CDC’s work was slow as most cases were chronic and there were not many cases. She left CDC because she did not want to be there for too long as the work was too slow-paced.

Ms Low Hong Siam (oral history, 2019) asked to be posted to MH in the early 1980s because she was thyrotoxic and had suffered three relapses. She thought MH would be a ‘calmer place’ which would benefit her condition. She added, ‘It was a really beautiful place, very calm, very serene...and really healthy environment’.

Ms Akhterun Nisha (oral history, 2019) remarked, ‘I will miss this place’, as CDC was full of nature, with many birds (including a large eagle and wild parrots) and trees. She loved the smell of the soil when it rained, and breathing the fresh air at 3-4 am whilst on the night shift; by contrast NCID is high-rise and high-tech.

Dr Hsu Li Yang (oral history, 2019) observed that CDC was an ‘anomaly’ and ‘a throwback to the past we will never see again’. It was unique because of its huge campus, lots of greenery, its flat, single-storied buildings, and patients who were usually not too ill (in recent times), which made the work slower-paced than in other hospitals.

However, our research found that more important perhaps than the physical environment was the social basis of the CDC community. The community was rooted in self-help and good relations among the staff, forged largely in response to an emergency or crisis.

Ms Cheong Yoke Lin (oral history, 2019) related that partly because the pool of staff at CDC was small, ‘We are like a family’. She remembered many instances of mutual help: ‘If you have a high rate of MC today...we will help each other’.

Ms Meeravathy PS (oral history, 2019) felt that MH in the 1970s was like ‘a small family’. There was a kampong feeling among the staff. She noted that working with infectious diseases in MH was different from other hospitals: for example, they had cholera bunks. She made good friends with her colleagues and played netball at MH with many of her colleagues. The staff also celebrated Christmas together at the hospital. But she was scared of snakes and musang cats at night.

Ms Vinotha Malar (oral history, 2019) also found MH to be a really nice place to work in, where the staff were like a small family. She also played in the netball team. She could see the hospital from her 23rd storey home nearby and remembered it fondly.

Mr George Yeo Poh Kee (oral history, 2019), the telephone operator at MH in the 1970s, knew everyone at the hospital. He likened MH to a garden.

His colleague Ms Joyce Arokiasamy (oral history, 2019) joked that George was affectionally known as ‘the connector’ – someone who was able to locate the nurses in the wards and who was close to all the staff.

More examples of the close relationships among the staff and their affection for CDC can be found in CDC’s *100 Years* (2007), and in the recollections and tributes in the forthcoming CDC photobook.

7.2 Diverse memories of patients

While we did not find many recollections of patients, those we interviewed had mixed memories of CDC. The patients’ experiences varied according to age, type of disease and ward environment. We have noted earlier two letters of thanks from an AIDS patient and the sister of another AIDS patient, both with nurse Ms Low Hong Siam.

Mr Eric Goh Wai Mun (email correspondence, 2019) was warded for diphtheria (likely in L Ward) as a child in the early 1950s. He was placed in a spacious and airy ward with a high ceiling and fans turning lazily. The ward had ten beds, lined in two neat rows, and open windows with no grills or bars. It was a children’s ward which was so quiet that one could hear the birds outside. The nurses moved so quietly that one hardly noticed they were there. Meals were taken at a communal table between the rows of beds, and the meals were substantial. He had soup with long pieces of three-layered pork. The patients slept very well in mosquito nets. He found the doctors and nurses pleasant and was impressed with the nurses’ white starched uniforms and starched caps with blue trim, the ancillary staffs’ white outfits, and the doctor’s starched coats. The children mostly kept to one another and their parents visited them in the early evenings. He recalled his head resting on a rubberised hot-water bottle that was commonly used in those days, filled with ice to cool his fever.

Mr Bachan Singh (oral history, 2019) was warded in MH for chickenpox as a boy in 1963. His experience was enjoyable. He felt pampered at the hospital, for every morning an ice-cream truck (possibly Magnolia) arrived to give them a cup of vanilla ice-cream. His supper consisted of bread and strawberry jam (which he did not have at home). He shared his ward with many young children (all of them boys), and they would play at night, covering their head with the bedsheet or chatting with one another. He was happy to sleep on a bed whereas he slept on the floor at home.

Like Mr Bachan Singh, Mr Narindar Singh (oral history, 2019) and his brother were also warded for chickenpox in MH as children in 1971. His stay was almost like ‘a holiday’, for there were few restrictions at the hospital. They played badminton in the evenings on the grass patch outside their ward. Their mother brought them cooked food from home. The nurses were kind and cooked hard-boiled eggs for them. He found MH to be the best hospital among the hospitals he had stayed in since. Other than him and his brother, the other patients in the ward were adults. There was an attendant who discreetly bought the patients *mee goreng* from outside for a small fee, as they found the hospital food terrible.

However, Ms Ow Lieyen (oral history, 1999) had a rather negative experience as a chickenpox child patient at MH:

During my stay there it was terrible, in the sense that I was the only person in the adult chickenpox ward, and just in the adjacent half ward was for babies, there were many babies down there. It was such a very lonely time down there. So I used to feel very homesick, especially in the night. And I think the nurses there on the whole, they were very nice people, and there was one nursing officer in particular who was very good in the sense that she knows I was homesick, so she would spend a little bit of time in the night with me. And I began to realise that these people are really doing good work for the patients.

Mr Prem Kallat (email correspondence, 2019) was warded in MH as a child for transverse myelitis around 1970. The doctors tested the progress of his paralysis by using a needle to jab his skin and asking him if he felt it. He spent part of his time in the corridor outside the ward to exercise, learning how to walk. It was only a short corridor of about 20 steps but it was a very long 20 steps for him to take. The worst part for him was not being able to pee or defecate: he had a catheter attached to release the urine. Once, he was given an adult-sized one by mistake, which was painful. He also remembered a nurse by the name of Ms A. Jacobs removing his faeces. It was also painful and she jokingly chided him for making so much noise, saying ‘You think I’m enjoying this, is it?’. Mr Prem was grateful to Dr Monteiro and other staff for caring for him in MH.

For Mr Paul Toh (oral history, 2019) of AfA and an AIDS survivor, CDC was an ambivalent place. When his good friend was hospitalised for AIDS in CDC in 1989, Paul found the hospital to be ‘very scary’. The wards were like army barracks (similar to those on Pulau Tekong), rundown and ‘dark and gloomy’. His friend was warded in a makeshift intensive care unit without any air-conditioning. CDC ‘did not even look like a hospital’. Taxi drivers often refused to drive inside and would drop the patients outside CDC. CDC was like a ‘death trap’ for AIDS patients and an ‘abandoned child’, removed from the city. On the other hand, Paul remembered the tranquillity and peacefulness outside the ward when patients passed away. CDC was a quiet place with a strong smell of Dettol.

Nurse Ms Dorothy Gomez (oral history, 2019) related how an AIDS patient began to bleed when his drip slipped. Her first instinct was to replace the drip but the patient stopped her, asking her to put on her gloves first to avoid contact with his blood. The patient was discharged, but has been in her memory for having thought of her safety.

In addition to our interviews, we also note an interesting collection of writings by HIV patients in *Inter-views: A Photovoice Collection*. This was a 2013 book edited by Photovoice SG, a non-profit community arts organisation founded by Jennifer Koh and Jasmine Seah. The book uses participatory photography to help people tell their stories. The group worked with TTSH and held an 8-week long photovoice workshop at CDC for 16 members of AGAPE, a support group for people with HIV. The book contains candid reflections on the difficult experiences of living with HIV.

One of the participants, Soul, wrote in a chapter titled, ‘Life’:

I was admitted to CDC ward with high fever and suspected pneumonia. March 2008. My start of taking HIV cocktails of medication...Life was lonely and depressing with no one to turn to except the medical doctors, the staff in CDC and a very close friend whom I always confide in. I was ashamed of the stigma associated with HIV. I kept the secret from family and friends. I was a walking mannequin...August 2012...One of the peer group activities organised by the CDC medical social workers was an outdoor gathering of HIV positive people at East Coast Beach. It was an opening to socialise and make more friends with people suffering the same illness. It was an awakening. Among the group, there was one. We became friends. We shared our life and supported each other. Life suddenly opened its doors to me. I was not alone anymore.

D. Recommendations for Heritage Programming

8 The Administration Block, doctors’ quarters, matron’s quarters, and some of the historic wards should be conserved and converted to new uses.

The rich tangible heritage of CDC with its historic pavilion-ward layout should be conserved. We propose to conserve the Administration Block, two doctors’ quarters, matron’s quarters, and some of the old wards. These buildings are important historic sites. Some of them trace to the founding of CDC in 1913, while others have handled major infectious disease threats and outbreaks in Singapore history.

We make a case for adaptive reuse. The conservation of CDC’s buildings will be consistent with URA’s 3-R Principle for heritage conservation: ‘Maximum Retention, Sensitive Restoration, and Careful Repair’. Our research found that the buildings frequently switched functions as circumstances changed. Some buildings were converted to new uses, beginning with the original sections for smallpox, bubonic plague and cholera until these diseases became rare. Ward 76 was used for poliomyelitis and subsequently AIDS patients. The staff quarters had also been converted to HIV day care and research offices in recent decades when the provision of staff housing became unnecessary. Since 1973, Wards 77-79 and 81-83 were utilised for skin and venereal disease patients from the Middle Road Hospital and its successor the National Skin Centre. This history of adaptive reuse supports an argument for refashioning buildings to new uses rather than demolishing them.

Dr Edmund Monteiro (oral history, 1997) aptly termed the Administration Block (Block 804) the ‘nerve centre’ of CDC’s daily work and operations. The block was built in 1913 and is architecturally unique, bearing the imprint of renovation and expansion works over the decades, the last being as late as 1992.

Additionally, the doctors’ and matron’s quarters should also be conserved. Large, well-maintained and built together in close proximity to one another in the southeastern side of CDC, they can be usefully converted to rental housing for families. Dr Monteiro’s family previously lived in the matron’s quarters during WWII.

We wish to highlight the historical significance of certain pavilion wards:

- The original Smallpox Section (Blocks 877-879), built in 1913.
- The original Plague Section (Blocks 873-875) and 3 observation and discharge wards, built in 1913.
- The original Cholera Section and 3 observation and discharge wards, built in 1913.
- Ward 76/E Ward (part of the Cholera Section, used later for poliomyelitis and AIDS).
- Ward 76A/L Ward (part of the Cholera Section, used later for diphtheria and palliative care for AIDS).
- The Cubicle Ward, built in 1956 and with a modern architectural design (Ward 2/Ward 71/ Block 871).
- Ward 1/Ward 72/Block 872, built in 1971 and with a modern architectural design (the airconditioned, paying class ward).

These wards dealt with major infectious disease threats and outbreaks in Singapore history. Many of them trace back to 1913 while others were built after the war and independence. It may not be feasible to conserve all the wards, but it would be important to maintain some of them for their history and architecture. They may also be adapted to contemporary uses.

9 CDC has varied heritage programming options as a theatre of memory.

Heritage programming should lean on the role of CDC as a theatre of memory. This involves a narrative not only of the work of CDC in infectious disease control, but also the memories, stories, relationships, and affections of the hospital staff, and the experiences of life, death and recovery among the patients and survivors, their families, and the community.

The case for memory-based heritage stems from the depth and complexity of people's recollections and reflections. Nurse Dorothy Gomez (oral history, 2019) aptly likened the closure of CDC to 'history closing doors'. Prof Leo Yee Sin (oral history, 2019) had mixed feelings about the closure which may also be common among the public: while CDC was a beautiful place that she will miss, she looked forward to a new beginning with NCID. Memory programmes should encompass both positive and ambivalent narratives towards CDC, such as those of the patients, survivors and their loved ones.

Such a broad and nuanced approach to heritage will not only highlight the contributions, failures and sacrifices made, but also help Singaporeans understand the historicity of infectious disease management in the country. This may also help reduce social stigma towards infectious diseases in the present and future.

A memory programme may broadly be applied to these topics and themes:

- The role of CDC in managing a variety of infectious diseases across Singapore history, in concert with government ministries, agencies and non-governmental organisations, bridging the colonial and post-colonial eras.

- The history and memories of the pavilion wards of CDC.
- The contributions and reflections of CDC staff, both senior and junior staff.
- The experiences and reflections of patients, survivors and their loved ones.
- Public perception of CDC and infectious diseases.
- A history of science, technology and society of infectious disease management.
- A social history of falling ill and getting well from infectious diseases.

Possible heritage programmes and activities include:

- A heritage gallery of CDC and infectious disease control in Singapore at NCID, including text, photographs, videos, oral history interviews, and historical paraphernalia.
- Heritage group tours of CDC, similar to the excellent ones led by Jerome Lim.
- Hosting of diverse cultural and heritage events and talks at CDC.
- Inclusion of CDC in heritage programming for the historic district of Balestier.
- Inclusion of CDC in heritage programming for Health City Novena, alongside other hospitals such as TTSH and the National Skin Centre.

E. Conclusion

This research project has documented the long history and rich heritage of Middleton Hospital and CDC across the colonial and post-colonial history of Singapore. It has annotated the contested origins of the hospital, its fraught subsequent developments, its role in tackling a wide range of infectious diseases, and the commendable efforts of its staff.

The project has also considered both the tangible and intangible heritage of CDC. Combining documentary research and oral history, it has uncovered CDC as a theatre of memory, containing the diverse memories and reflections of the staff, patients and wider community. History and memory offer real possibilities of conserving and highlighting the tangible and intangible cultural heritage of infectious disease management in Singapore.

F. Acknowledgements

We are indebted to the following agencies, organisations and individuals for their valuable support, assistance and participation in the course of the research:

- National Heritage Board
- Singapore Land Authority
- Urban Redevelopment Authority
- Tan Tock Seng Hospital
- National Centre for Infectious Diseases
- National Museum of Singapore
- Singapore Press Holdings
- Ms Sharon Lee (SSHSPH)
- Mr Stephen Loh (TTSH)

- Mr Harbhajan Singh (TTSIH)
- A/Prof Chew Suok Kai (MOH)
- Prof Chew Chin Hin (TTSIH)
- Ms Meeravathy PS
- Ms Leong Wai Ying
- Ms Melody Zaccheus (SPH)
- Mr Jerome Lim
- Our interviewees: Dr Edmund Hugh Monteiro; A/Prof Chew Suok Kai; Dr David Allen; Mr Harbhajan Singh; Ms Akhterun Nisha; Mr Prem Kallat; Mr Goh Wai Mun, Eric; Mr Narindar Singh; Mr Leong Kwai Wah; Mr Bachan Singh; Ms Linda Leong; Ms Ong Quek Neo; Ms Han Kwee Yin; Ms Meeravathy PS; Mr George Yeo Poh Kee; Prof Roy Chan; Ms Dorothy Gomez; Ms Vinotha Malar; Mr Paul Toh; A/Prof Ooi Peng Lim; Prof Leo Yee Sin; Ms Low Hong Siam; Ms Rama bai Nathan; Ms Iris Verghese; Ms Cheong Yoke Ling; Ms Joyce Arokiasamy; Ms June Leng; Prof Chew Chin Hin; Dr Hsu Li Yang
- Our researchers: Ms Kymelya Sari, Mr Mok Ly Yng, Ms Isabel Drake, Ms Jasmine Chin, Ms Madeline Gwee, Ms Lim Xin Hwee, Ms Nur'ain Noor Bani, Ms Jillian Colombo, Ms Charmaine Ang, and Ms Koh Yan En